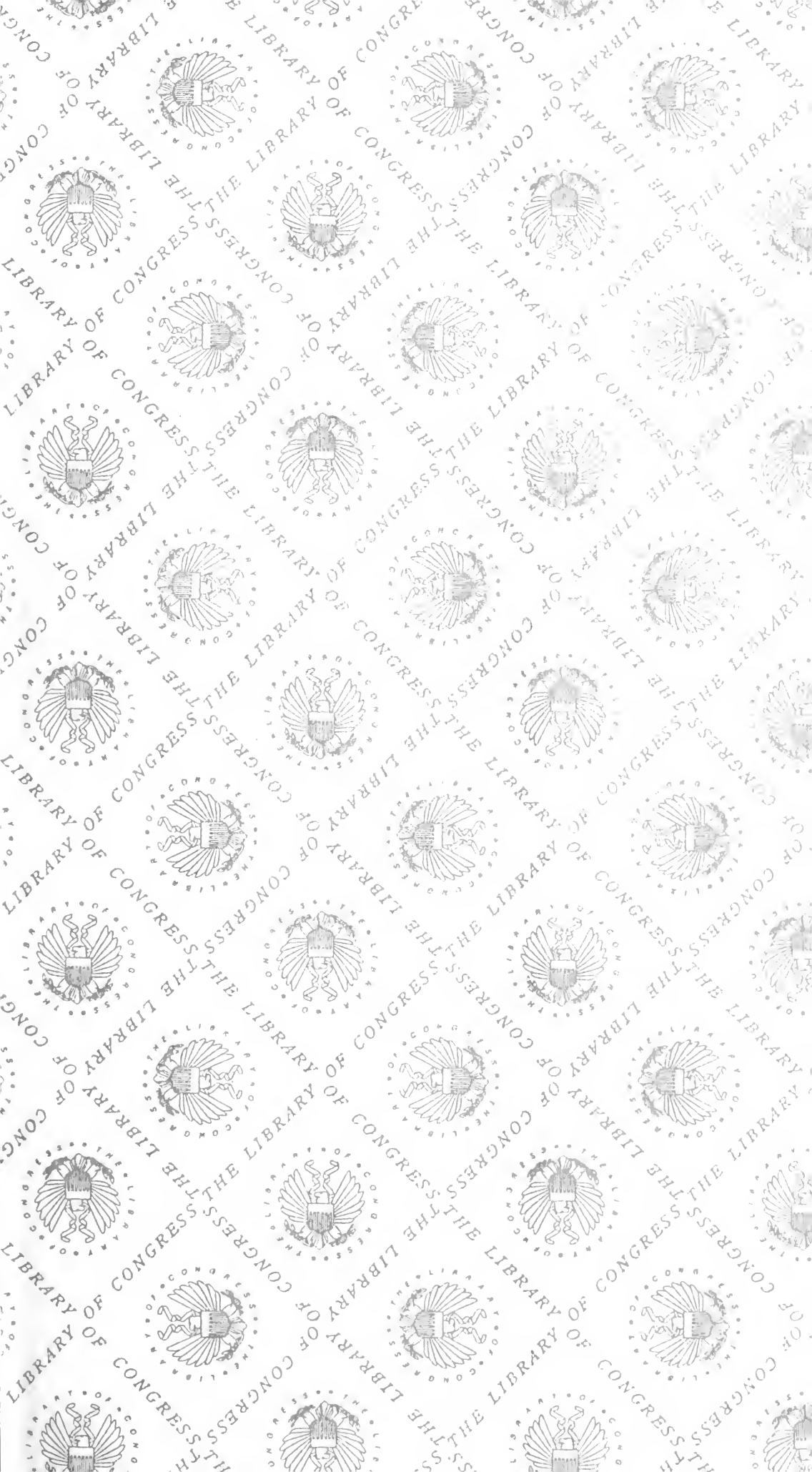
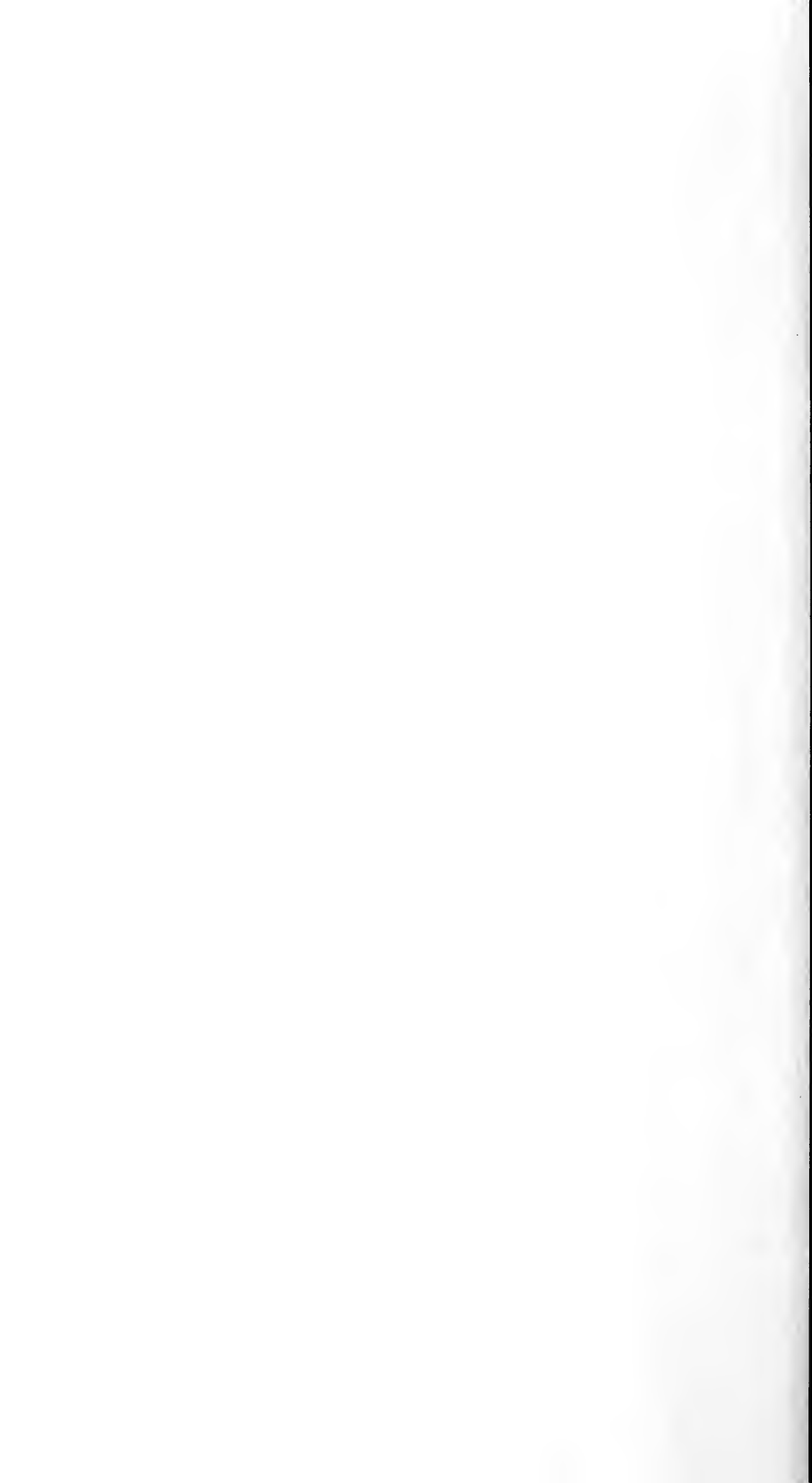


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Factor in the Development of
the United States

A THESIS

PRESENTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF CORNELL UNIVERSITY FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

BY

GEORGE DAVID HUBBARD

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GOLD AND SILVER MINING AND REDUCTION PROCESSES AS RESPONSES TO GEOGRAPHIC CONDITIONS.¹

By GEORGE D. HUBBARD, Oberlin College, Oberlin, Ohio, U.S.A.

GOLD and silver receive different methods of treatment varying with their occurrence and association. All through the story of their mining

¹ This paper is a portion of a thesis presented as a part of the requirement for the Ph.D. degree in Geography at Cornell University. See this *Magazine*, 1910, pp. 449-466; *Bull. Amer. Geog. Soc.* 1910, pp. 594-602, and a later number; and *Bull. Geog. Soc. Phil.* 1911, pp. 1-22, for other parts. Special thanks are given to Professors R. S. Tarr, W. F. Willcox, and H. Ries of Cornell for criticism and suggestion throughout the whole work.

in the West, the responses and adaptations to conditions have brought changes in methods of mining and handling, and have developed mechanical and technical skill and inventive genius.

GOLD.

Placers.—In most localities in the Western U.S.A. and Alaska, this metal was first discovered in gravels and sands in or near stream-beds whither the streams had carried it from nearer their head-waters. There they found it in fragments formed by the disintegration of country rock containing gold in veins and ore bodies. As the rock was carried down stream it was sorted, and much of the lighter and more destructible fragments was swept entirely away, while what remained contained most of the gold. The waste left along the stream-bed was made up of rounded gravel, sand, and the fine pieces of gold, and was deposited more or less uniformly. Such auriferous deposits are called placers, and were very rich in the gulches of the Sierras and common all through the mountains. Because of the ease of detecting the metal in them they were the first forms of gold to attract attention. The process of sorting out barren rock-waste and concentrating the gold in a much smaller quantity of earth has been of inestimable value to man. He takes up the work where Nature left off, and by further concentration eliminates all but the gold.

The simplest and cheapest method of mining placer gold is that of washing the auriferous gravels in a pan or even with a shovel or in a short sluice, with water to remove the rock fragments and thus to separate the gold, which, by virtue of its greater specific gravity, remains in the pan or behind cleats on the bottom of the sluice. This method was used because it was simple and effective in the rich, unconsolidated placers, and because its apparatus was at hand or quickly made. Time in those days was gold. Its use continued because it was so effective in the high-grade gravels, and because complicated apparatus was not obtainable and was no more effective. Apparatus that would get the most gold in the shortest time and in the easiest way was the kind used. Bancroft¹ explains that these methods continued in California because the abundance and richness of the deposits lasted, and because miners were relatively few. The same law has held in many placer deposits outside of that State. Owing to these factors, when the amount of gold obtained in one gulch became too small, it was cheapest to move to a new, unoccupied one and continue the use of the simple machine. But because the continuous influx of men, attracted by the gold and the opportunities that gold-mining presented, so increased the competition; and because the crude but rapid mining so soon compassed the richest beds, less remunerative gravels had to be worked, and improved methods devised to recover more perfectly, and at a single washing, the valuable contents of the earth. The above simple processes, used at first, required little or no

¹ Bancroft, H. H., *Hist. of Calif.*, vol. vi. p. 409.

co-operation, and hence tended to develop independence of work and thought.

The less remunerative gravels were simply bars, or deserted stream-beds, which, owing to less favourable conditions for deposition, contained a lower percentage of gold; or else they were deeper down and required more labour and expense for the same return. Under the impulse of these new conditions, and in order to cheapen the process, a long sluice with more cleats to catch the gold, called a long-tom, also a hand rocker similar to an old-fashioned child's cradle with cleats across the bottom, were used. These machines, called for by the poorer gravels, required two to four men to work in a squad, but made it possible for them to produce about the same values as if working each for himself in better gravels. Royce¹ shows that the long-tom or long sluice mining meant increased responsibilities of many sorts, and so in the end made for good order. It also had a part in developing that social compact whose factors were called "pards," because of their partnership work with the machine. Then as the business was extended, longer board sluices, and finally, because the boards wore out too fast, long rock-floored ditches came into use, requiring a larger squad, and hence demanding a larger company of profit-sharers or the employment of wage-earners.

More water was needed with these larger machines used in working lower-grade gravels. When it was near, little expense arose even in the use of the more improved methods; but if the water-supply was insufficient or not permanent, capital and more costly works were necessary. In the first place, ditches or flumes were made to lead the water from external sources to points where it was needed. In the second, as much as possible had to be made of the water that was near, and it had to be so used that it could not destroy the works after storms. This co-operation and the more permanent nature of the plant for water conveyance, gave more permanence to camps, just as have river-bed mining and hydraulicking in other places.²

From the washing of the sand in marginal sand-bars to that of the gravel of the stream-bed was only a step. In order to reach the latter, the water had to be crowded off by a wing dam and a portion of the bed exposed. Then to get the entire river bottom the whole stream was diverted, and, to avoid the expense of dam construction, dredging with simple machines was introduced from New Zealand, where it had originated³ and found rather general use. The dredging machinery, placed on a boat, raised the gravels from the bottom, washed them, recovering the gold, and returned them either to the water or to the land in the rear of the machine. A dredge boat was often launched in the water in an artificial pool made by excavating a hole in the bed of river alluvium, and the boat and pool advanced by digging gravel out in front and piling it in behind the machine.

¹ Royce, Josiah, *California*; in *Amer. Commonwealth Series*, 1886, p. 310.

² Royce, *loc. cit.*, p. 312.

³ *Twelfth Census* (1900), *Mines and Quarries: Gold and Silver*, p. 573.

Owing to ease of handling the gravel, this method was capable of working deposits of very low grade.

Back from the stream, and usually a little above, occurred the bench gravels; and when these were found to contain ore, specially adapted methods arose to win it from them. Water was led out of the stream above the benches by a wing dam and conducted to the place in a ditch with less fall than had the stream. Then the washing began in rockers and long-toms. The workmen soon learned where to find the richest streaks in these benches or terraces and finally tunnelled for them. In Alaska, where the benches are sometimes of glacial origin, the richest streaks are differently distributed,¹ and required different treatment. Owing to climatic conditions, the gravels here are frozen most of the year, and must be thawed to be washed. At first they were thawed by building fires on them, but now this is usually done by driving pipes into them and then forcing in steam. Shafts and horizontal tunnels along rich leads are thus made.² Because these deposits are in a land of continuous frost, tunnels need no timbering, and shafts no pumps.

From stream gravels to beach sands was a short step, and in California many devices for working the latter have been tried and left to decay.³ The difficulties are lack of fall for sluices, and, sometimes, lack of water. In California the Oregon tom, a short sluice, has been adopted. At Nome lack of fall declared against all sluices, and the surf against dredging. Rockers were used almost exclusively.

Still another set of conditions, the deposits of arid lands, has given rise to the process known as dry-washing or dry-blowing. In New Mexico⁴ many unsuccessful attempts to utilise the wind have been made; and now a screen set obliquely and ribbed with riffles is supplied with placer material, and air is blown through the screen from behind to remove fine dirt. Coarse material is swept off with the hand, while the gold collects above the riffles. Owing to the absence of water for ordinary washing, many varieties of dry-blowing have been used in Southern California,⁵ Northern Mexico,⁶ and in Australia,⁷ some of which were borrowed from the natives and some devised by the foreign miners; but all that were successful were adjusted to the highly specialised conditions of no water, dry dirt, suitable winds, and cheap labour.

All the above processes were used because of a special mode of occurrence of the gold—in loose, easily worked placers—and were of service only in such deposits. All were adapted to the special conditions

¹ Kemp, J. F., *Ore Deposits*, 1900, p. 393. *U.S.G.S. Professional Paper* 15, pp. 52, 54; *Mines and Minerals*, 1900, p. 492.

² *U.S.G.S. Bull.* 225, 52-53.

³ *Scientific American Supplement*, 1900, p. 20,381.

⁴ *Mines and Minerals*, 1899, pp. 397-8.

⁵ Bowie, A. J., *Hydraulic Mining in California*, p. 79.

⁶ *Eng. and Min. Journ.* (1897), vol. lxiii, pp. 257-8.

⁷ *Am. Inst. Min. Eng. Trans.* 1898, vol. xxviii, p. 490 f.; also *Eng. and Min. Journ.* vol. lxxv. (1899), p. 37.

in which the gold was found. Some had been used, in principle at least, in the foreign countries from whence many of the miners had come ; but their introduction and improvement in the West was a direct response to the influence of the geographic conditions in which the gold occurred, and under which the men were obliged to work.

Amalgamation.—A modification of several of the above methods greatly raised their efficiency. Mercury had been discovered in California five years prior to the gold discoveries,¹ so that its use was possible as soon as conditions made it necessary ; and now small quantities were put behind the riffles in the sluices to form an amalgam with the gold and thus recover many minute fragments formerly lost. Amalgamation processes had been used in Potosi, South America, near where mercury was mined, since 1571 ; also to some extent in Mexico, although the long distance to its source, Huancavelica or Spain, was almost prohibitive. By taking advantage of the presence of mercury, an advantage due to the geographic distribution of mercury, the South American miners and, later, those of California greatly increased their output and cheapened their processes. In the absence of mercury Mexico must have mined in the old wasteful way or have paid heavily for imported mercury.

Hydraulicking.—Men continued to come into the gulches and valleys, and the gravels and sands were becoming exhausted ; hence prospectors and miners pushed farther up the streams to find new or better deposits, and, in 1851, discovered the fossil stream-beds high up on table mountains. The gravels and sands of these beds were stream-laid ages ago, and then overlaid with lava. Subsequent erosion had cut these deposits—lava, gravel, and sand—in two and removed a part of the gold-bearing beds, and after sorting and rewashing the gravels, and concentrating the gold, transferred them to the present valley floors. The remaining portions were rich and extensive, but could not be worked in the ordinary ways. The lava cover prevented beginning at the top. Most of the gold was at the bottom of the channels, and to get it required either moving the entire filling, or the construction of tunnels and the removal of the pay gravel. Tunnelling was expensive because continuous timbering was necessary. Then no water was near for washing. To develop these supplies of gold required capital and labour, and here began the first extensive systematic hired mining.² An adaptation of the long-tom sluicing with men shovelling gravel into the feed boxes was the initial device. In 1852, a man desirous of economising labour made a raw-hide hose and with water under head washed gravel into his sluice. His neighbours followed, and then improved by using first canvas hose, stove pipe, sheet-iron, and then heavy wrought-iron flumes, thirty inches in diameter and furnished with an elaborate nozzle. Some of these flumes were thousands of feet long,³ and being connected with ditches or tunnels 10-100 miles long,⁴ led water in large quantities from some higher level, often from beyond a divide, down to the partially cemented gravels with such

¹ Hubbard, G. D., *Bull. Geog. Soc. Phil.* (1911), vol. ix. p. 7.

² Bowie, A. J., *Hydraulic Mining in California* (1885), p. 48.

³ Bowie, A. J., *loc. cit.* p. 49 f. ⁴ Eissler, Manuel, *Metallurgy of Gold* (1900), p. 51.

force as to tear them down and break them to pieces and then wash them into long sluices. Here their gold contents were sorted and caught in mercury behind the riffles. Sometimes the gravel was so firmly cemented that dynamite was exploded to aid the water in breaking it down. This new, elaborate process, called hydraulicking, could not be used successfully in other kinds of deposits, but was ultimately closely adapted to the requirements of these ancient gravels. Thus the cost of handling the gravel was reduced from dollars per cubic yard in the rockers of 1848 and 1849, first to \$.35 in the long sluices, and then to half a cent in the hydraulicking process. Those who had resisted the temptation to spend all as fast as it was acquired usually became the capitalists in this new form of co-operation, while those who had wasted all, or who had been the victims of hard luck, became the labourers or withdrew to other occupations.¹

Placers of Sierras and Rockies Contrasted.—Much the larger proportion of the placer-mining in the West per unit area has been in California. The Cretaceous rocks of the Sierras with their ledges of free milling ores, disintegrated into good placers with gold of a high degree of purity; but the propylitic rocks of the Rockies with their complex associations have not furnished so much placer gold nor such good quality as that in California. This geographic distribution of placers and their parent rock has had a beneficent influence on the development of the mining industry of the West. The native gold or gold in simple associations was found first, and where it could be easily worked, hence the industry flourished from the start. Had the two kinds of bed-rock deposits exchanged places, it would not have been so easy to find the first placers; and if the Eastern placers had been found first, they would hardly have been able to furnish capital for the later development of veins and lodes. And had the Sierra kind occurred in Western Colorado and Idaho, many of the hardships incident to reaching and developing the region would have been increased. Neither men nor provisions could have reached the place by sea. The long land journey from the East would remain, although much shortened, but there would have been added to the sea route a long difficult land route, from the coast far inland.

Vein Mining.—As gravels became exhausted, prospectors, followed by miners, pushed on up the ravines and discovered the quartz veins from which the gravel had come; and then there arose a different kind of mining. In these auriferous ledges as found in most of the Western States and even in the Southern Appalachians, the gold was intimately associated with other minerals, and the whole mass had to be broken out of the country rock and crushed before the precious metal could really be claimed. This required time, expensive machinery, mechanical skill, and withal a deal of adjustment to the conditions in order to operate the mines successfully. But, as shown above, capital was not wanting, and experiments began. By a normal process of selection a method of mining and reduction was perfected, but not until many fortunes had become exhausted and companies dissolved. Beside the exhaustion of the richer

¹ Bancroft, H. H., *Hist. of Calif.*, vol. vi. pp. 416, 418.

placers, another factor aided in the development of the quartz-mining. Hydraulic mining, discussed above, had been entered into by multitudes. By 1858, in California alone, six thousand miles of water-ditches had been built. About this time the waste from hydraulicking began to interfere with agricultural interests, and by 1884 the interference had advanced to such an extent that prohibitive legislation checked its further operations,¹ and capital and enthusiasm turned to quartz-mining, thus still more increasing the latter form which had now become well developed.

In the early days of quartz-mining the ore was crushed by stamps or rollers, and the rock flour washed as in the placer works. This process in its most perfect state did not save all the gold, so others were devised to meet the difficult combinations presented by the ores. A method known as the chlorination process has now come to be used extensively. The crushed ore before or after concentration, and sometimes after roasting, is treated with chlorine gas, which forms chloride of gold, soluble in water and removed by washing. From this solution the gold is easily recovered by precipitation with iron sulphate. Stamp mills customarily accompany chlorination plants, and smelting works are sometimes associated to handle special ores. This process is especially adapted to rather high-grade ores and those practically free from iron. A second chemical method probably more used than the above is known as the cyanide process, and is most serviceable in the treatment of low-grade ores. It finds its special field in the reduction of ore carrying iron and copper sulphides. The crushed ore in a "slime" condition is treated with a strong solution of potassium cyanide, usually strongly aerated, and the gold is thus brought into solution and separated from its refractory native compounds. Furnaces often follow the cyanide tanks, where with suitable fluxes the reduction to metallic gold of specially rebellious ores, by means of chemical reactions requiring heat, is effected. Had the ore occurred in small or more scattered deposits, even these processes would probably fail to extract the metal economically; but since large quantities of ore, even though of low grade, can be obtained within a limited area and be treated simultaneously, the expensive plant with its trained men, technical skill, valuable apparatus, altogether a costly equipment, can be operated at a profit. Illustrations of the failure of extensive plants to remain in operation are common; and usually they go out of business because the deposits are not as large as supposed, or because their contents are found to change character in the course of development, or because some resource, water, fuel or timber, has failed.

As already shown, the geographic conditions favoured the great development of placer-mining in the early days and called for little development of bed-rock ores. Table I. shows that there has occurred a great change since 1880 in the relative importance of quartz and gravel as sources of gold. In the early days of California and of most of the other States and Territories, including the Carolinas, Georgia, and even Alaska, a very large percentage of the metal came from gravels. No

¹ Hubbard, G. D., *Bull. Geog. Soc. Phil.*, vol. ix. (1911), pp. 14-15.

reliable statistics on this point dating back farther than 1880 have been found. In 1905 only 17 per cent. of the total gold production came from gravel. Alaska, the youngest gold producer, supplied over one-half of that amount, and she is also the only one with more than a handful in its total production that recovered more metal from gravel than from quartz. Owing to increased Alaskan placer-mining during 1906 and 1907 the total percentage of placer gold has gone up during these two years. Alaska is still in the placer stage of her gold-mining. If this territory with its relatively large placer production be taken out of the figures in Table I., the change in the source of gold will become much more apparent. This change occurred partly because the placers were insufficient to employ the men who had been attracted by them, partly because the placers were becoming exhausted, and there was no other mining but quartz to which the men might turn. The wealth accumulated from the early forms of mining was ready to go into the more expensive and complex processes, and the conditions required it.

TABLE I.—DISTRIBUTION OF GOLD AND SILVER AS TO SOURCES OF PRODUCTION.

Year.	GOLD (Fine Ounces).		SILVER (Fine Ounces).		
	Quartz.	Placer.	Quartz Ores.	Lead Ores (b).	Copper Ores.
1907	3,034,609	1,192,890	19,038,042	19,038,449	14,200,348
1906	3,374,639	1,328,361	16,792,799	21,011,464	19,288,709
1905	3,568,724	697,018	13,990,008	25,147,252	16,964,340
1904	3,245,097	647,383	15,113,401	26,973,843	15,595,556
1903	3,062,762	591,219	16,835,528	25,682,882	13,844,232
1902	3,315,717	597,964	16,988,647	28,035,620	12,812,291
1901	3,243,248	609,974	16,064,208	27,018,344	14,790,934
1900	3,269,794	597,850	16,496,711	30,593,763	13,121,912
1899	3,062,286	450,958	15,861,230	29,000,609	11,859,334
1898	2,812,579	372,215	13,716,882	31,312,676	10,457,275
1897	2,525,387	390,858	12,233,429 (c)	32,244,341	11,637,395
1893	...	...	27,641,100 (c)	24,713,100	7,645,800
1880 ¹	1,741,654	580,478 (a)	...	...	...

(a) Excluding Alaska with 288 ounces.

(b) Colorado lead and copper ores, amounting to about one-half of this item each year, are not divided but are placed under lead together.

(c) Quartz and free milling ores combined.

Methods that are used with some kinds of ore are worthless in the treatment of others, and processes profitable under certain conditions would cease to be remunerative under others. In each locality a method of extraction and reduction capable of handling the ore in its mineral associations, and also adapted to the conditions of water, fuel, and transportation, must be devised. Because of the relation of mining and

¹ *Twelfth Census (1900), Mines and Quarries: Gold and Silver*, p. 547.

reduction processes to the vicinal geographic conditions, the latter may seem in cases to control the output; and so they do. But herein occurs an excellent measure of the influence of the metals. They are sometimes able to combat and overcome very gigantic obstacles. Many shaft and tunnel mines in California successfully met the conditions, because in the midst of timber. Had they with the same gold values been located in places where timber is so scarce as around some working surface mines in Arizona, New Mexico, or Nevada, the output of the mines could not have borne the expense because of their moderate values. But many mines in these more arid, forestless States are so rich that they can sustain the long timber hauls, the struggle (and often great expense) to obtain water, the difficulties of costly transportation, or the flooding of the mines with water, and have prospered for years against the heavy odds. The almost fabulous wealth or other special advantage of certain districts has enabled them to surmount the greatest obstacles and to produce enormous quantities of the precious metals. The Comstock¹ lode mines suffered because of excessive heat and of flooding with underground water, as well as through being in a desert with nothing near that was needed.

The Treadwell² mines on Douglas Island, Alaska, situated on a very low-grade ore body, in high latitude, and one thousand miles from Seattle, are able to run very satisfactorily because of abundance of water, sufficient water-power during the seven open months, plenty of fuel, cheap sea transportation, ore fairly uniform, constant as depth increases, abundant, and easily gotten out of the ground; and again easily reduced, because a large part of the values can be recovered by amalgamation. The average cost of operation here for nine years was \$1.73 per ton, and the yield \$2.18 per ton.³ It is in the ability of these gold deposits to overcome such enormous difficulties that their influence is most clearly manifested.

Effects on Scenery.—The influence of some of the above processes on the surrounding features, landscape, forest, and stream, is very appreciable. Gulches once as beautiful as a picture have been dug over, washed out and refilled with débris, upon which vegetation has not yet obtained a footing. In many places desolation is the only word. Scarred hill-sides and pillaged ravines are seen at almost every turn in extensive mining regions. Of course gold-mining is not very different from other mining in this respect, but the speed with which ends have been reached and destruction wrought will compare favourably with any other mining operation. The early California days, however,⁴ did not witness damaged forests except where these were cut for building houses (rare structures at first), because timber was not needed to support tunnels and shafts so long as placer-mining continued; but later the axe worked havoc, gathering material to timber the shafts and tunnels in the quartz seams and to build mills, roads, and railroads. The same sequence may be

¹ *U.S.G.S. Monog.* iv., pp. 56 f., 389 f.

² *U.S.G.S. Bull.* 225, pp. 28, 42.

³ *Twelfth Census* (1900), *Mines and Quarries: Gold and Silver.*

⁴ Bancroft, H. H., *History of California*, vol. vi. p. 416.

noted in many places in other States. Where smelters producing noxious fumes are being used, their influence on the vegetation is appalling. It is stated¹ that there are no trees in Butte and Anaconda, Montana, although formerly there were plenty. Sulphurous acid gas is produced by roasting sulphide ores, and this gas is destructive to vegetation. It is also a disinfectant, killing disease germs. Through special efforts recently to check the nuisance, its destructiveness had been so reduced that a few small gardens and some house plants are now growing.²

¹ Correspondence with H. V. Winchell, April 1905.

² Correspondence with W. H. Weed, March 1905.

GOLD AND SILVER MINING AND REDUCTION PROCESSES AS RESPONSES TO GEOGRAPHIC CONDITIONS.

By GEORGE D. HUBBARD, Oberlin College, Oberlin, Ohio, U.S.A.

(Continued from p. 426.)

SILVER.

INASMUCH as silver is rarely found in gravel and never abundant there, the amount of placer silver-mining is negligibly small. For this reason there is little single-handed mining. Although silver was known in California almost as soon as gold, it was never much worked. It was found in other States nearly as soon as was the gold, and its mining usually followed that of gold. Bancroft¹ thinks that silver-mining was largely prevented in California for several decades because of the abundance and accessibility of the richer metal. It has been suggested that Californians, having worked in gold so long and so successfully, did not care to mine the less noble metal. This may have some weight even yet with the average Californian. It would certainly have had more weight in earlier days. But whatever the mental attitude of the Californian toward silver-mining, it would not interfere with others from the East conducting silver-mining operations there. It is true, however, that California's silver production is very small compared with that of several Western States, and there is probably a good reason for this in the occurrence of the metal. Silver is usually obtained with other metals which bear the expense of mining, but in California, Shasta, the leading county, is the only region where metals other than gold are extracted from the silver-mines. Here copper practically pays expenses, and the silver may be counted as profit. In other places, as far as known, the silver is alone or with gold, and does not occur in rich deposits. It may be said, then, that the mining of silver is not generally profitable, and hence not carried on, in California, because of its mode of occurrence.

Deposits other than superficial, are the chief sources of the metal in the West, hence mining operations and appliances are such as are best adapted to that kind of ore working. The contents of the vein are removed, crushed by stamps or rollers, and passed on to the separating devices. If no other metals occur, the silver is separated from the waste by amalgamation or smelting. But the ore with copper is smelted with its gangue and then separated by subsequent chemical processes. In a similar manner the separation from lead ores is accomplished. When zinc occurs the problem is a difficult one. At Canyon City and Pueblo, Colorado, there have recently been constructed plants for the conversion of such rebellious ores. The process converts the zinc into white oxide for which there is a strong Eastern market. This rises from the roasting ore as a fume, having the appearance of white smoke, and is condensed by cooling, after which the ore may be treated for the silver content.

¹ *History of California*, vol. vii. p. 651.

These silver reduction processes are all expensive and more or less involved, requiring capital, labour, fuel, apparatus, and technical skill; but large quantities of ore render their operation both possible and economical.

Special Types.—Two or three special types of silver occurrence and associated reduction plants may well be examined to discover the relation of plant and process to the ore and its surroundings. First in order of time was the Comstock lode,¹ whose development and twenty years of startling history began in 1858, and from which the first silver in Western United States was taken. The metals in this lode occur in quartz along a contact of two igneous rocks where there has been some slipping. The lode is hundreds of feet broad in the widest portion, while it tapers out and divides before disappearing at the ends. Mines have been located along it for two miles. Nothing short of a bonanza, however, could have survived the litigation and physical difficulties in the way of its development. A rocky, parched, barren mountain slope, over a mile above sea-level, deserts all around, only meagre brooks in the main ravines in spring, all of which were dry in summer; water gotten only from lakes twenty miles distant; no timber for buildings or mine support within at least as many miles, and this all to be hauled over sandy or stony roads, and no fuel but scrub nearer than this distant timber; roads cut and blasted through canyons and along ledges and mountain precipices, and out over high Sierra passes, always snow-filled in winter; severe winters, deep snows and high winds; no crops, and very difficult and expensive transportation of food and all supplies from San Francisco; peculiar, irregular, and unfamiliar distribution and occurrence of ore resulting in great loss in developing; inadequate laws and regulations, conflicting claims and confusion of titles leading to enormous and ravaging lawsuits; the mine, as it deepened, flooded with alkaline waters, and hampered with temperatures of 100° to 140° F. and great humidity,—these constituted some of the difficulties. It seemed as if nothing could be accomplished. But so great was the power of glamour and the actual wealth, that many difficulties were overcome, and others were borne while a city sprang up on the site. The population of the territory increased by immigration, attracted by the marvellous reports, until statehood was granted in 1864. Nothing else known in that barren region would have called people thither. Not only did the development of this great lode attract the attention of miners and scientists, but its output disturbed the world's monetary system.² When its prime was reached in 1877 and its total production of gold and silver had mounted up to about \$300,000,000, its decline came rapidly; for in four years the annual production fell from \$36,000,000 to \$1,000,000,³ then rose to two, three, and even seven millions, but fell off again through the last decade to less than \$200,000. The cessation of operations at the

¹ *U.S.G.S. Monogr.* iii., pp. 3, 6; *U.S.G.S. Monogr.* iv., pp. 56-76, 86, 190, 203-205, 331-3.

² Tarr, R. S., *Economic Geol.*, p. 182; Watson, D. K., *History of Amer. Coinage*, pp. 120-238; Ries, H., *Econ. Geol.*, pp. 494-5.

³ Lord, Eliot, *U.S.G.S. Monogr.* iv., p. 416.

great Comstock lode was due to a failure of the company to master certain geographic conditions—viz., the mines filling with water faster than the machinery was able to pump it out, and the encountering of high temperature. Thus the water and the excessive heat made further development impossible. The population of the State declined to a point below the statehood limit, and the region reverted to its former wilderness condition. In this mine, some two hundred miles of tunnels have been opened, and wide galleries where the lode was wide and rich. These tunnels are supported by timbers, and the galleries were literally filled with blocks of wood and stone as the ore was removed. All the wood came from the forests some twenty miles to the west over a barren waste of sand and without a railroad. When the mine was apparently approaching prosperity, the supporting timbers caught fire and burned, which necessitated the added expense of replacing them or abandoning parts of the workings. Probably more has been spent in the Comstock region than the total output of the mines would replace. Efforts are now being made to revive the big mine. New pumps and new and repaired machinery are increasing the yield, until in 1901, 1902, and 1903 each the production was over \$1,000,000. Since 1903 it has again fallen off to less than \$250,000, but has been gradually rising in the last two or three years.

Since the ore is native silver and gold with some argentite, in a gangue of quartz, stamp mills or other ore crushers, and adapted amalgamating pans, are all that is necessary for its reduction. Before the end of 1861, companies to operate such mills to the number of eighty-six, capitalised with an aggregate sum of over \$60,000,000, had been organised in the region; and many others followed soon after.¹ The mills were far in excess of the needs of the mines in their best days, and now scores of them are rotting down on their flimsy and too hastily constructed foundations. This enormous waste was due to men under the influence of the glamour and the possibilities of the great lode; and now, sobered by thirty to forty years, we look back and wonder and smile at their delusion.

Leadville,² Colorado, forms a second type. Work in this region began in a gold placer in 1860, to which miners rushed from many quarters, and from which was taken several million dollars worth of gold. A flourishing mining town, Oro, sprang up; but when the gold became exhausted its creation, the town, declined. In 1874 the lead carbonate, carrying silver, a weather product of the deeper-lying sulphides, was recognised; and in five or six years its enormous development again gave the region a good rank as a mining centre. The new town, Leadville, grew from a few log-houses, a 10 × 12 grocery store and two saloons, with a population of one or two hundred in 1877, to a city of 15,000 with \$8,000,000 to \$30,000,000 assessable property, twenty-eight miles of streets, waterworks, gasworks, schools, churches, hospitals, and fourteen smelters in 1880. The lead carries good values in both gold and silver.

¹ Lord, E., *loc. cit.*, p. 126.

² *U.S.G.S. Monogr.* xii., pp. 1-16, 375-6, 614, 636-47.

The ore really is an argentiferous galena bearing native gold and, deeper down, zinc in a gangue of barite, chert, and calcite within a vein along a limestone-porphry contact. Copper, manganese, bismuth, iron, antimony, molybdenum, and others have been recovered from this heterogeneous deposit; but zinc, silver, lead and gold, usually in the order named, are the best payers.¹ This region contains a greater assortment of metals and more complex associations than almost any other in America. Placer-miners were troubled with the lead carbonate, commonly called heavy rock, in their sluices from the start; and their process was modified to avoid difficulties and dispose of the unknown rock. When its nature became known, and the bed-rock sources were discovered, shaft-mining and mill reduction began. But these carbonate and associated sulphides could not be worked by crushing and amalgamation as were the ores of Comstock; hence, smelters using the dolomitic limestone of the vicinity and the coke from coal-fields a few miles distant were constructed. Crushers were associated with the furnaces to reduce the coarser pieces of ore, but their work was only a minor part of the process.

This second type of silver ore is characterised by its complexity and by large values in lead and zinc, and the reduction plant to be successful must respond to the conditions and become itself more complex. Lead and zinc-mining are profitable here, because the silver and gold occur with them and may be added to the output with little expense. The decline in the price of silver recently aided in closing a number of the Leadville plants. So intimate is the relation of ore and process that neither lead nor zinc can be recovered unless silver remain above a certain figure.² Lead is a rather common associate with silver in several Western States, notably Utah, Idaho, and Washington. The famous Eureka of eastern Nevada is also classed here.³

A third type is that of Butte, Montana. This region began as a gold and silver-mining centre, but has become the greatest copper-producing region in the world, with large quantities of gold and silver as by-products. The ores, as now worked, are mainly copper sulphides with some galena and blende in a quartz gangue with moderate values in silver and gold. The mines are situated along veins cutting the granite knob upon which Butte is situated, and their product is smelted at Butte, Anaconda, and Great Falls. The output in 1906 was as follows—copper about \$55,000,000, silver \$7,000,000, gold \$1,250,000, and lead \$51,000. The ore cannot be treated as is that of either of the above types, nor can it be mined in the same way. The geographic conditions and associations of the silver require specifically different processes. Furthermore, no such hardships and difficulties have to be overcome in the two latter types as in the first. Early transportation difficulties have been overcome by the construction of railroads. Fuel is near in both cases, timber is abundant and good, the water supply is adequate, and water in the mines is easily

¹ *U.S. Dept. Treas. Ann. Repts. on Prod. of Precious Metals*, 1903 f.

² *Ibid.*, 1900, p. 115; Tarr, R. S., *Econ. Geol.*, p. 235.

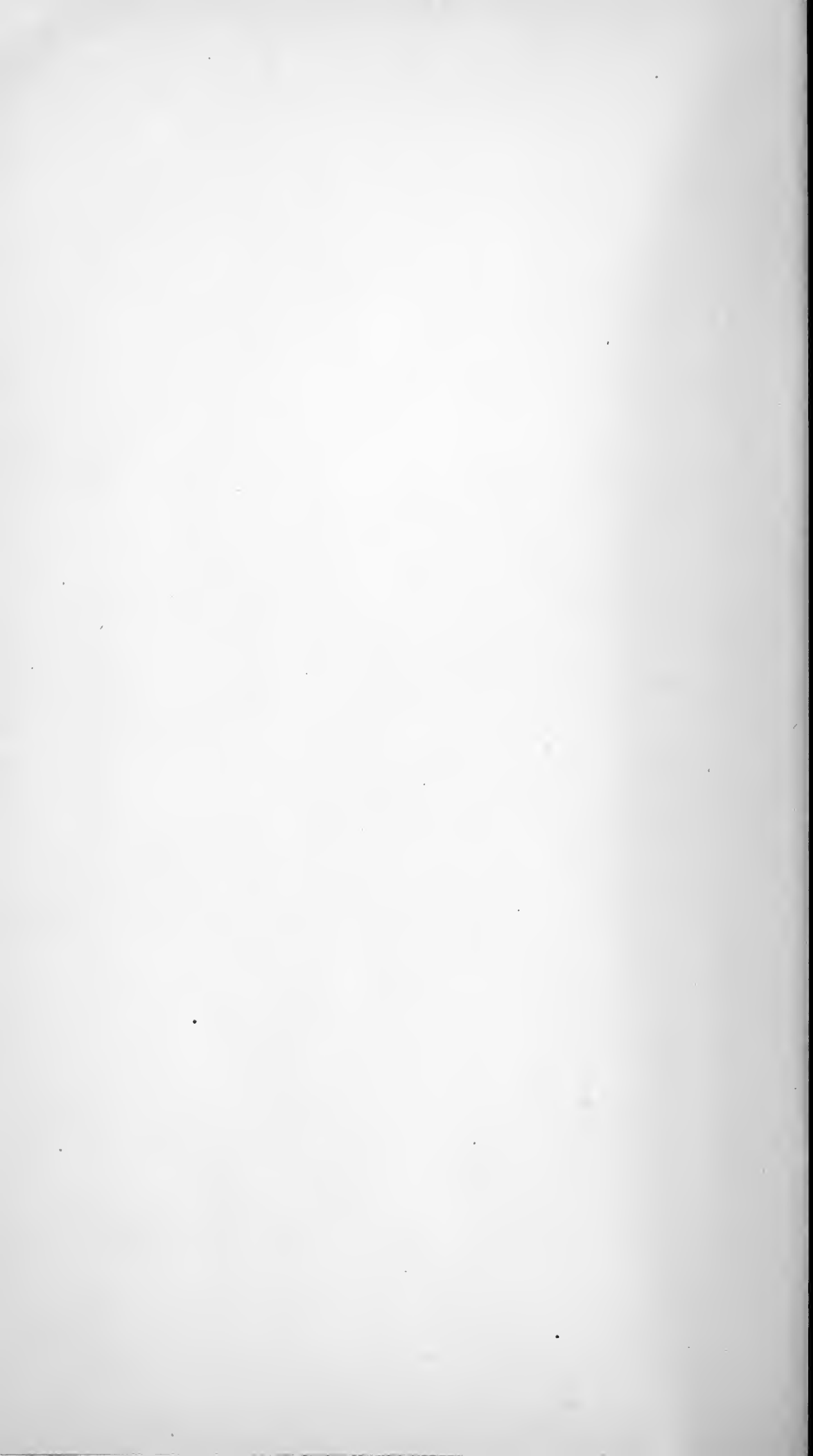
³ *U.S.G.S. Monogr.* vii., p. 64-79.

controlled. The Butte association of silver with copper is common in Utah and Arizona.

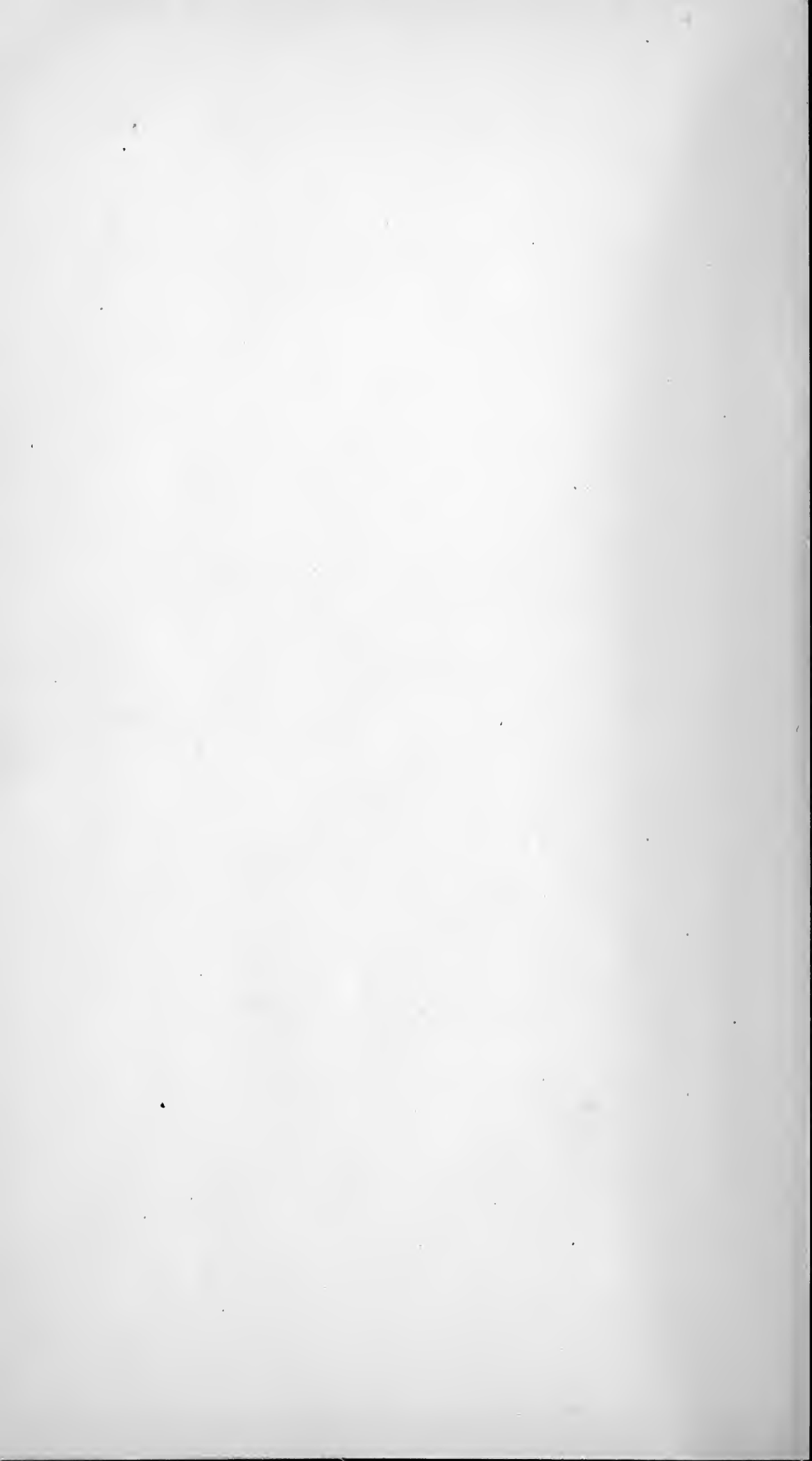
Table I. (p. 424) shows a marked change in the relative amount of silver recovered from each of the three types of ore. This partial desertion of the quartz ores for the copper ores is due, in part, to the discovery of the new and more closely adapted metallurgical processes required by the more complex ores, and, in part, to the association of two or more by-products with the silver whose value with that of the silver makes possible, with similar outlay, a total production of metal of greater value than that possible in the pure quartz-mining.

Summary.—Not many of these deposits which are now yielding in the aggregate by far the major portion of our silver, could be operated at all for the silver alone. Hence it is due to its association that the silver output is what it is. On the other hand, when the price of silver declines or the ore values in silver fall below certain figures, certain mines must shut down, curtailing the supply of copper, lead, or zinc at the expense of the factories using these metals. In each of these three types, the metallurgical processes used depend upon the associated minerals; and the general problems met vary with the supply of timber, water, food and transportation.

In all the mining processes discussed the influence of the geographic conditions, including both telegraphic relations and mineral and rock associations, have aided in determining—first, whether the deposit shall be worked at all or not; second, what processes shall be employed, *i.e.* whether cradles and toms, dredges, stamp mills or smelters; and third, what problems of transportation, supplies, and materials must be met, and how they are to be solved. It is true that man's knowledge and skill are important factors all through the general problem of extraction and reduction of the precious metals; but it is equally true that the closer man causes his machines and processes to conform to the natural requirements, the greater his success; and that the ruins of plants and dismantled machines all over the West proclaim the fate of apparatus and process that is not a response to the conditions.







THE RELATION OF GOLD AND SILVER MINING TO THE DEVELOPMENT OF ASSOCIATED INDUSTRIES.¹

GEORGE D. HUBBARD.

Relative Magnitude of Several Industries.—Perhaps no industry in America aside from agriculture has done so much pioneer work for other industries as has the mining of the precious metals. The reason for this appears in the distribution of their production. The relative importance of the different states in the industry is also shown in accompanying tables (I and II), which still further show in which of the states to look for the greatest influence of the metals, as well as those in which their influence may be small or practically wanting. This phase of its influence, together with its relation to other industries upon which it in some degree depends, or which depend more or less upon it, constitutes a large and important field for study. In the aggregate, the value of the output of this industry seems enormous, and truly it is; but lest too exalted an opinion of its magnitude be gotten from this study of its influence, the figures for a few crops and industries are inserted in Table III. According to the last census² there were in the United States forty-two industries, the products of any one of which possess a value greater than that of gold or of silver mining, and twenty-three whose individual values are greater than that of both gold and silver mining together.

This table (page 4), containing only a few of the items and not all of the large ones, makes it clear that it is not necessarily the industry whose product has great value that creates the most stir or most profoundly influences man and his work. Lead smelting and refining has an output 20 per cent. larger than both gold and silver. Carpentering has twice as large a value as both combined. Gold

¹ This paper is a portion of a thesis presented as a part of the requirements for the Ph.D. degree in geography at Cornell. See *Scottish Geog. Mag.* and *Bull. Am. Geog. Society* for other parts. Special thanks are due Professors Tarr, Willcox and Ries, of Cornell, for criticism and suggestion throughout the whole work.

² 12th Census U. S. (1900), Abs., pp. 322-323.

TABLE I.
GOLD PRODUCTION IN UNITED STATES BY STATES.

Rank.	1899.		1900.		1901.		1902.		1903.		Rank.
	State or Territory.	Production in M Ounces.	State or Territory.	Production in M Ounces.	State or Territory.	Production in M Ounces.	State or Territory.	Production in M Ounces.	State or Territory.	Production in M Ounces.	
1	Col.....	1,257	Col.....	1,395	Col.....	1,340	Col.....	1,377	Col.....	1,090	1
2	Cal.....	735	Cal.....	765	Cal.....	817	Cal.....	812	Cal.....	779	2
3	S. Dak...	313	Alaska...	395	Alaska...	333	Alaska...	404	Alaska...	417	3
4	Alaska...	264	S. Dak...	299	S. Dak...	313	S. Dak...	337	S. Dak...	330	4
5	Mont....	230	Mont....	227	Mont....	229	Mont....	212	Mont....	213	5
6	Utah....	167	Ariz....	203	Ariz....	198	Ariz....	199	Ariz....	211	6
7	Ariz....	124	Utah....	192	Utah....	179	Utah....	174	Utah....	179	7
8	Nev....	107	Nev....	97	Nev....	143	Nev....	140	Nev....	164	8
9	Idaho...	91	Idaho...	83	Idaho...	90	Ore.....	88	Idaho...	76	9
10	Ore.....	69	Ore.....	82	Ore.....	88	Idaho...	71	Ore.....	62	10
11	Wash....	33	N. Mex..	40	N. Mex..	33	N. Mex..	26	Wash....	14	11
12	N. Mex..	28	Wash....	35	Wash....	28	Wash....	13	N. Mex..	12	12
13	S. Car..	8	S. Car..	6	Ga.....	6	S. Car..	6	S. Car..	5	13
14	Ga.....	5	Ga.....	6	N. Car..	3	Ga.....	5	N. Car..	3	14
15	N. Car..	2	Wyo.....	2	S. Car..	2	N. Car..	4	N. Car..	3	15
16	Wyo.....	1	Mich....	1	Mich....	1	Wyo.....	2	Ga.....	0.654	16
17	Va.....	0.343	N. Car..	1	Wyo.....	0.614	Va.....	0.148	Va.....	0.654	17
18	Texas...	0.334	Va.....	0.155	Va.....	0.256	Va.....	0.121	Kan....	0.468	18
19	Ala.....	0.208	Ala.....	0.092	Ala.....	0.150	Ala.....	0.119	Ala.....	0.213	19
20	Me.....	0.175	Texas...	0.053	Texas...	0.029	Ala.....	0.119	Wyo....	0.175	20
21	Md.....	0.039	Mo.....	0.033	—	—	—	—	Tenn....	0.038	21
22	Mich....	0.005	Mo.....	0.005	—	—	—	—	Md.....	0.024	22
23	Mo.....	0.005	Tenn....	0.005	—	—	—	—	—	—	23
24	Vt.....	0.005	—	—	—	—	—	—	—	—	24

TABLE II.
SILVER PRODUCTION IN UNITED STATES BY STATES.

Rank.	1899.		1900.		1901.		1902.		1903.		Rank.
	State or Territory.	Production in M Ounces.	State or Territory.	Production in M Ounces.	State or Territory.	Production in M Ounces.	State or Territory.	Production in M Ounces.	State or Territory.	Production in M Ounces.	
1	Col.	22,663	Col.	20,484	Col.	18,438	Col.	15,676	Col.	12,990	1
2	Mont. ...	16,096	Mont. ...	14,195	Mont. ...	13,132	Mont. ...	13,244	Mont. ...	12,642	2
3	Utah	7,093	Utah	9,268	Utah	10,761	Utah	10,832	Utah	11,197	3
4	Idaho	3,852	Idaho	6,429	Idaho	5,543	Idaho	5,855	Idaho	6,507	4
5	Ariz.	1,578	Ariz.	2,996	Ariz.	2,812	Nev.	3,746	Nev.	5,051	5
6	Nev.	843	Nev.	1,359	Nev.	1,813	Ariz.	3,043	Ariz.	3,387	6
7	Cal.	824	Cal.	941	Cal.	926	Cal.	901	Cal.	932	7
8	Texas....	520	S. Dak. ...	536	N. Mex. .	563	Wash. ...	619	Texas....	454	8
9	N. Mex. .	503	Texas....	477	Texas....	472	N. Mex. .	457	Wash. ...	295	9
10	Wash. ...	256	N. Mex. .	434	Wash. ...	344	Texas....	446	S. Dak. ...	221	10
11	S. Dak. ...	146	Wash. ...	225	Ore.	160	S. Dak. ...	340	N. Mex. .	181	11
12	Alaska...	140	Ore.	115	Mich.....	81	Mich.....	111	Alaska...	144	12
13	Ore.	134	Mich.....	102	S. Dak. ...	78	Ore.	93	Ore.	118	13
14	Mich.....	112	Alaska...	73	Alaska...	48	Alaska...	92	Kan.	97	14
15	Maine	0.500	N. Car. ...	11	Wyo.	21	N. Car. ...	21	Mich.....	50	15
16	Ga.	0.400	Ga.	0.400	N. Car. ...	20	Tenn.....	12	Tenn.....	13	16
17	S. Car. ...	0.400	S. Car. ...	0.400	Va.	0.700	Va.	6	N. Car. ...	11	17
18	Wyo.	0.400	Wyo.	0.200	Ga.	0.400	Wyo.	5	Va.	10	18
19	N. Car. ...	0.300	Ala.	0.100	S. Car. ...	0.200	Ga.	0.400	Ga.	0.400	19
20	Ala.	0.100	—	—	Ala.	0.100	S. Car. ...	0.300	S. Car. ...	0.300	20
21	Md.	0.100	—	—	—	—	Ala.	0.100	Wyo.	0.200	21
22	Mo.	0.100	—	—	—	—	—	—	—	—	22
23	Va.	0.100	—	—	—	—	—	—	—	—	23

TABLE III.
VALUES OF CERTAIN CROPS AND PRODUCTS.

Extractive Industries, 1899.		Manufacturing Industries, 1899.	
Industry or Product.	Value.	Industry or Product.	Value.
Gold mining (product) .	\$71,053,000	Iron and steel.....	\$804,000,000
Silver mining (product) .	70,807,000	Printing and publishing	347,000,000
Iron mining (ore)	58,000,000	Cotton goods	339,000,000
Corn	828,000,000	Carpentering	316,000,000
Wheat	370,000,000	Lead smelting and refining . .	175,000,000
		Cheese, butter and condensed milk	131,000,000
Cotton	324,000,000	Marble and stone work	85,000,000
Oats	217,000,000	Confectionery	81,000,000
Eggs	144,000,000	Shipbuilding	75,000,000
Poultry	137,000,000	Brick and tile	51,000,000
Potatoes	98,000,000		

production is not so large by 10 million dollars as the total for confectionery and is surpassed by the value of the potato crop to the amount of 27 millions. The product of either the poultry or egg industry is about equal to the total gold and silver output; while corn, wheat, cotton and oats is each millions beyond the precious metals. In spite of their minor statistical rank, however, what of their importance? What of their influence on other industries?

Further, Table IV (part A) shows that, although the mining of gold and silver is important in many ways, its intrinsic value compared with several other industries is not great even in some of the western frontier states. It makes clear the fact (part B) that the per capita production of gold and silver is almost universally smaller than that of either agriculture or manufactures, the former restrained by climate and the latter by general frontier conditions. Five single states east of the Mississippi each had a production of manufactures greater than that of all these eleven states and territories combined, and the manufactures of New York were more than three times as great as all; while that of these western states aggregates more than six times the value of their gold and silver output.

And this minor industry has broken the way, provided the means and called the labor west for the development of many industries. It has successfully demanded people, railroads, manufactures, agriculture and general industrial development over a third of continental United States far in advance of the fondest dreams of the most sanguine colonizer.

TABLE IV.
COMPARATIVE VALUE OF VARIOUS INDUSTRIES BY STATES, 1900.
(In millions of dollars—Abstract 12th Census.)

Product.	Arizona.	California.	Colorado.	Idaho.	Montana.	Nevada.	New Mexico.	Oregon.	Utah.	Washington.	Wyoming.	Total.
PART A.												
Sale of live animals in 1899 . . .	2.90	13.00	8.00	4.00	9.00	2.00	4.00	7.00	3.00	4.00	4.00	60.90
Dairy produce . . . . .	.54	12.00	4.00	1.00	2.00	.43	.50	3.50	1.50	4.00	.42	29.90
Wool . . . . .	.43	1.70	1.10	2.00	5.00	.70	2.00	2.40	2.60	.62	4.00	22.55
Wheat . . . . .	.28	20.00	3.00	2.00	1.00	.26	.39	6.00	1.50	9.00	.20	43.65
Hay and forage	1.30	19.00	8.00	4.00	6.00	2.00	1.40	6.00	4.00	6.00	2.30	60.00
Fruits . . . . .	.16	28.00	.69	.47	.14	.03	.24	1.50	.41	1.40	.006	33.046
Gross agricultural products . . .	7.00	132.00	33.00	18.00	29.00	7.00	10.00	38.00	16.50	35.00	12.00	337.50
Gross manufactured products . .	21.00	303.00	103.00	4.00	57.00	1.60	6.00	46.00	21.00	87.00	4.30	653.90
Gold and silver ³	6.00	16.00	42.00	5.70	13.50	2.80	1.10	1.80	9.70	.86	.034	99.494
PART B. (IN DOLLARS.)												
Agriculture value per capita . .	57.00	89.00	61.00	112.00	118.00	160.00	52.00	92.00	60.00	67.00	129.00	Alaska
Manufactures value per capita . .	173.00	204.00	191.00	25.00	235.00	39.00	29.00	111.00	76.00	168.00	46.00	.13
Gold and silver value per capita	48.00	11.00	80.00	35.00	55.00	67.00	5.00	4.00	35.00	1.66	.40	67.00
												128.00

³U. S. Dept. Treas. Ann. Repts. Prod. Precious Metals in U. S., 1900, p. 15.

Prehistoric Mining and Metallurgy.—Even back in prehistoric time, Indian metallurgy, in response to the occurrence of gold, developed methods for smelting the ore. The Cherokees were successful smelters of gold in Georgia where De Soto found them, each with a long clay-tipped reed in his mouth sitting around a concave stone, upon which were laid a few pieces of auriferous quartz, and blowing a fire placed below the heap. The Peruvians and Mexicans washed gold-bearing gravel, and the former mined quartz-silver ledges as deep as they could shovel the rock out. This ore they smelted with blow-pipes similar to those used by the Cherokees. Even these simple and primitive processes seemed to have been known only where the ore was known. Subsequently, under the stimulus of the presence of the metal, the natives developed more complex and more closely adapted processes.

Interrelation of Early and Later Mining.—The relation of placer mining to later gold and silver mining has been suggested. It seems probable that had there been no placer gold to point the way, call miners west, and furnish easily gotten capital for the development of quartz mining, the latter, in its mountain fastnesses, would have been much later in development, and perhaps even yet would not have appealed to men. It certainly was very fortunate that the rich auriferous gravels were widely distributed to introduce their ancestors to prospective miners.

Influence on Utilization of Gangue Minerals.—The influence of the precious metals on the production of lead, copper and zinc was first felt in the West when mining of the latter began. Prospecting for the more valuable ores revealed the others; but their working nowhere began until they were encountered in the gold or silver mines and could be recovered with the latter. It is doubtful if the development of the lead, copper or zinc industries in the western states would have attained to any considerable importance even down to the present, if the precious metals had not blazed the way. There are many mines now producing both silver and lead, zinc or copper, which could not operate for one alone. Fortunately lead, used for a flux, is found with silver in many places in sufficient quantities for the smelters. But in a few places the flux does not occur and must be shipped to the works. In response to the demand for lead ores, both British Columbia and Mexico sent appreciable

amounts.⁴ Many gangue minerals, occurring in the seam with silver or gold and requiring removal to recover the metal, are now saved and turned to economic importance. Sometimes the gangue mineral is of more value than the gold, but without the latter to attract attention, add zest to the mining pursuit and help pay expenses, it would never have been developed away off in the West. Some such metallic ores have been mentioned. Other gangue minerals taken in the general process are fluorite, antimony and arsenic compounds, and a number of minerals yielding the rarer metals.

Stimulation of Mercury Mining.—Quicksilver mining received quite an impetus when its product began to be applied to the reduction of gold and silver. For several years after its usefulness was discovered, little was found in America; but in 1567 the metal, in cinnabar, was found abundant at Huancavelica in Peru. Since its value was known, and the precious metal ores both of Peru and Mexico were adapted to its use, the business of mining and transporting it to the gold mines leaped into full-fledged maturity at once.⁵

In the early forties this metal was discovered in California, but no use was known for it there, and the considerable distance to the mines of Mexico did not encourage its output; but when the placers of the Sierra gulches were found, the position of California's mercury gave it a tremendous advantage over the South American cinnabar deposits, and under this geographic advantage the young industry flourished. Under the constant stimulus of the markets of the West, the mercury mines have increased their output, until the United States produced in 1901⁶ two fifths of the world's total and California 90 per cent. of that. In fact, the production is now far above our own needs, and mercury is sent to China, Mexico, Alaska, British Columbia and to Latin America.

Influence on Various Manufacturing Industries.—The various metallurgical processes connected with the reduction of gold and silver are consumers of large quantities of chemicals. The chlorination process stimulates the salt industry, from whose product chlorine is derived. Large quantities of potassium cyanide are used

⁴ U. S. Industrial Com., 1901, Vol. 12, p. xli.

⁵ Stirling, P. J., "Gold Discoveries and their Probable Consequences," 1853, pp. 127-133.

⁶ U. S. G. S., "Min. Resources," 1902, pp. 251-258.

in the cyanide process; while zinc, iron sulphate, manganese peroxide, caustic soda, lime, and the mineral acids contribute to the outfit of the large establishments; and this demand for chemicals increases the business of chemical manufacturing concerns.⁷

The first process required pans and shovels and more or less repairing; hence, at the outfitting towns and commercial centers, blacksmith-shops and forges were set up. Even in 1849 and 1850 there were several, and during the next few years others followed. Many such concerns failed because of the fluctuating demand; but in 1861 and 1862 prices became steadier and the location of the camps more permanent, resulting in the rapid improvement of these little plants and the introduction of more extensive machine shops. Then came the invention and construction of machinery for the various new processes. Nozzles, flume-irons, chains, dredging machines, engines, stamp mills, and various separators, and unheard-of devices for all sorts of processes were made. Many types appeared which were good for nothing but the rubbish heap or the furnace after having served as a stepping stone to a better adaptation. Mills and machine shops increased as their business grew. Special modes of occurrence and peculiar conditions required special machinery, and several towns took upon themselves to supply the desired articles; but their attempts frequently failed because of their isolated positions with reference to the mines and the sources of materials; while San Francisco has taken a leading rank in making highly specialized milling machinery, pumps and engines.⁸ Her work is characterized by ingenuity, originality, great adaptability, and independence of precedent. San Francisco has become the tenth American city in manufactures, shipping apparatus in large quantities to many points in the West, and also to Mexico, the South American states, British Columbia, and even to Australia and South Africa.

Gold and Silver in the Arts.—One line of manufacturing which in the West is especially responsive to the call of the mining industry is jewelry making. While the center of the business is on the Atlantic coast, many thousands of dollars' worth are made in San Francisco and other cities of the mountain states. In the early California days, some small beginnings were made, and by the close

⁷ Eissler, Manuel, "Metallurgy of Gold," pp. 345-6; Park, J., "The Cyanide Process," 1900, pp. 4, 96.

⁸ Bancroft, H. H., "History of California," 1884, Vol. VII, pp. 94-95.

of 1850 several good local enterprises had been built up, because of the work that the miners wanted done. Denver and Salt Lake City share this industry. In 1880, the California jewelry establishments consumed between 50,000 and 60,000 ounces of silver beside much gold. Yet only a small per cent. of the jewelry sold in California and the West is of local manufacture. The metals go east, are manufactured mostly in and around Providence, R. I., and New York City, and their products return.⁹ A considerable amount of the annual production of both metals is used in the industrial arts in gold and silver plating, gilding, leaf work and solid wares. The following table (V) gives the amount of gold used in each of the

TABLE V.

PRODUCTION AND USE OF GOLD AND SILVER IN THE WORLD.
COMMERCIAL VALUES.

Year.	Metal.	Production.	Used in Industrial Arts.	Per Cents of Total Production.	Coined or Stamped in Bars at Mint.	Per Cents of Total Production.
1901	Gold	\$260,992,900	\$79,268,000	30	\$248,093,787	95
1902	Gold	296,048,800	75,764,400	25.5	220,405,125	75
1903	Gold	325,527,200	76,350,600	24	240,496,274	74
1901	Silver	103,805,700	26,435,800	25	57,072,308	54
1902	Silver	85,507,200	25,654,190	30	79,588,484	93
1903	Silver	92,039,600	27,072,346	30	87,223,743	94

years 1901, 1902 and 1903 in this way, also the amount coined in the world, with the per cent. of each figured on the total production of the world. Seeming impossibilities in connection with the per cents. will disappear, when it is remembered that only about two thirds of the gold used in the arts is new gold, coin and old jewelry making up the other third; and that several per cent. of the gold coined is old coin recoined. Moreover, there is often an unused balance left over from the previous year.

The following table (VI) shows the amount of gold and silver used in the arts by the leading nations in their relative rank for the calendar year 1901.

Four nations manufactured about three fourths of all gold used in the industry. Great Britain was the greatest consumer, with the United States a close second. United States is the only country using any considerable amount of gold in the arts that produces

⁹ *Ibid.*, VII, p. 97.

TABLE VI.

LEADING NATIONS USING GOLD AND SILVER IN THE ARTS IN 1901.

Nation.	Gold.	Silver (Commercial Value).	Total.	Per Cents of Total Used.
United States ..	\$17,379,100	\$7,709,100	\$25,088,200	cir. 24
Great Britain...	19,147,100	5,304,200	24,451,300	cir. 23
France	14,355,400	3,656,700	18,012,100	cir. 17
Germany	7,139,800	2,893,000	10,032,800	cir. 9.5
All others.....	21,246,600	6,872,800	28,119,400	cir. 26.5
Totals.....	\$79,268,000	\$26,435,800	\$105,703,800	100.0

her own gold; hence, there must be a movement of gold to England, France and Germany. In the case of England, this comes mainly from her colonies. We export large quantities, both to France and to Germany, thus aiding their use of the precious metals and increasing our export. But the fact that the sources of gold and silver in such large quantities lie within our own borders is much more important to the development of the use of the precious metals in our own work in the industrial arts, than it is to that of any other nation. Table VI shows that we use about one fourth of the gold and one third of the silver which the world uses in the arts. Our great home production makes it easy for us to obtain our supply, and probably aids in stimulating the desire to manufacture and use such large quantities of both metals. For this reason, we, a young nation, are using more gold and silver in the arts than Great Britain, an old, rich, established nation.

That portion consumed in the industrial arts is used in various factories, printing establishments and local jeweler's shops. In very few cases, if any, is gold the chief raw product, and probably in no case is it the only one. It is said that most of the gold from the South Atlantic States in the early part of the last century was purchased by local jewelers, who were anxious to get it because its fineness exceeded that of coin.¹⁰ Most of the gold manufactured, aside from that used by local jewelers, is made up in a few eastern cities, but the use of silver is more widely distributed. Four states, Rhode Island, Massachusetts, New York and New Jersey,¹¹ in the order named, make over seven eighths of all jewelry reported to the census; and the city of Providence has about one half of the

¹⁰ Whitney, J. D., "Auriferous Gravels," 1854, p. 117.

¹¹ 12th U. S. Census, "Manufactures," I, cc.

industry, while New York City and Newark, N. J., have respectively one fifth and one seventh. Two small suburbs of Providence, Attleboro and North Attleboro, both in Massachusetts, each have a considerable percentage of the total. In gold and silver leaf and foil, New York City leads with 75 per cent. of the industry, and Philadelphia, Chicago and Boston follow with the balance. These three or four eastern centers lead in these industries because the smiths located near their wealthy markets years ago, and because the large amount of capital needed in the industry could more easily be had in the East; and the change in source of raw material has not been sufficient reason to overcome their adjustment to these environments. Hence they stay there. It is not the production nor place of production that determines the place of manufacture. Bar gold, silver bricks, bullion or ore can be shipped more easily from the West to market than could the delicate manufactured product.

Mining and Lumbering.—The roaming prospector found the timber and in locating his mine took a long step toward the development of the forest cutting, since a mine or a mining plant requires lumber in great quantities. This need establishes a market for saw-mill products. In California, late arrivals in the fall of 1849, unable to get into the gulches for mining, began cutting wood, which found ready market in San Francisco and elsewhere. They received \$15 per cord for it, and the boatmen received \$40 for it in the city.¹³ This is the elementary example of what took place systematically in many localities, where mining could not be carried on during the winter. The men engaged in lumbering in the winter and mining in the summer. Much more now than in the earlier days the saw-mill goes into camp with or before the stamp-mill and smelter. From the extraction of lumber for mining purposes to the general industry is but a step, and where the railroad to the mine has made lumbering at its terminus or along the route possible, there is often a vigorous development of the industry.

The Trades and Other Local Occupations.—Thousands of miners drifted into Salt Lake City and San Francisco and either loafed or engaged in the trades as they could find opportunity. A whole group of such trades developed, made necessary and possible by the presence of mining. Some preferred trapping to any city occupa-

¹³ Taylor, B., "Eldorado," 1857, pp. 290-291.

tion. Ferrying, and with it river navigation, wherever the streams permitted, were important adjuncts to the pioneer industry. Road construction early began to receive attention, because, first, supplies must be taken to the camps; and, second, the products of the camps were sufficient to pay the expense of building. While some roads were thoroughly adequate, however, most of the West was never well equipped. Make-shifts were made, or nothing at all was done beyond what the teamster had to do to get his load along. In the hydraulicking region roads were never safe any more than other property. A gold seeker could by law, and often did, sluice a road away or cut an impassable channel across it and leave it for years. Exceptional cases are on record. A party of hydraulic miners washed a road out for many yards because it was in their way; and then, having finished their exploitations, peeled the soil and loose rock from the hillsides above the road, with the same engine that had wrought the destruction, and washed enough back into the old roadway to repair the damage they had done. The restoration was not expensive and was as rapidly accomplished as an army of men with teams could have done.

Hydraulic streams, introduced for mining purposes alone, have been applied to various herculean tasks in the West. Material has been washed into a stream for the construction of a wing dam by the use of the powerful stream. In the same manner the Sound in front of Seattle is being filled to make new land for the use of the city. In Montana a ditch for the conveyance of water was made in the soil by the plowing action of a gigantic hydraulic stream. Probably none of these uses would ever have been made of hydraulic streams had not the idea been suggested in mining. More extended use than that so far accorded it may yet be made.

Influence on Agriculture.—The mining of the precious metals in the United States, from its beginnings, has been in close touch with agriculture. In the first rush in California, men, all over the state, deserted farms for gravel bars, and essentially crippled the industry. Occasionally a man remained on his ranch and continued to produce wheat, fruits or cattle, and with the enormous demand for fresh products he was able to obtain fabulous prices. It was often as good a business as mining and much more healthful.¹⁴ A considerable number of miners soon saw this and joined

the ranks of the food purveyors. Agriculture received a tremendous boom during the early years of gold mining, because of the sudden, prodigious development of the demand for its products wherever mining developed. Not only was the industry affected in the mining districts, but the influence went abroad through many states. Washington and Oregon, more advanced in settlement and development than any other western region in 1848 and 1849, were greatly disturbed.¹⁵ Excessive emigration and curtailment of immigration robbed every industry of its men. Agriculture especially suffered. But the depression was short-lived, for in the general advancement of the West these two territories felt the stimulus strongly, and the rapid development of their industries is a measure of their response. The benefits were specially felt among the poorer people. Many were in debt and unable to earn enough to pay their obligations. But by the enlarged market and higher prices, created by gold mining, money became so abundant that debts easily melted away. Because these territories were a little more remote than California, their industries received much more moderate and healthful shocks.

But with the beginning of hydraulicking in California, agriculture was found to be in a losing race with mining, both in the field and on paper. Mining was the predominant industry, more universal, used more men, produced more value and created many times more interest. With the greater importance of mining almost universally conceded, it was not hard to override agriculture and several other industries. Practically every industry of a mining district suffered interference in some way.¹⁶ Mining was indeed a great industry, and the people were under its spell. They were short-sighted, prejudiced, self-deceived, not perceiving that to cripple agriculture meant to cripple the state. Industries that should have gone hand in hand because of their interdependence became intensely antagonistic. Even state legal decisions were discriminating. By the ruling of state courts "Agricultural lands although in the possession of farmers may be worked for gold," and "the right belongs to miners to enter on public mineral lands although used for agri-

¹⁴ Bancroft, H. H., "History of California," Vol. VI, p. 65.

¹⁵ Bancroft, H. H., "History of Oregon," Vol. II, pp. 56-57; "History of Washington, Idaho, and Montana," p. 13.

¹⁶ Shinn, C. H., "Mining Camps," 1885, pp. 260 f.

cultural purposes by others, and, whether inclosed, or taken up and entered under the Possessory Acts." "All persons who settle for agricultural purposes upon any mining lands in California settle at their own risk." "The miner . . . may at any time proceed to extract any valuable metals which he finds in such lands." "The fairest of gardens, thriftiest of vineyards, most fruitful of orchards, one and all, were liable to be destroyed without remedy by early placer miners." They might "undermine houses, wash away fertile fields, move towns to new sites and tear the old location down to bed rock with torrents of water."

It became apparent very early that war had been declared between the two belligerent interests. Greivous complaints were entered, and attempts at combination made among the farmers. The miners haughtily claimed their rights. The first real organization was effected on Bear River, a tributary of the Sacramento, when the land owners formed the Protective Association to prosecute mining companies for damages. It was asserted that this stream, before hydraulicking began, was clear and pure, and in these few years had been made so muddy that it was of no value for irrigation; and that its bed had been aggraded ten to fourteen feet, while the stream overflowed its banks, devastating fields along its course.¹⁷ But the organization failed to accomplish results, because the blame could not be located. The members of a camp washed earth into the stream and damaged crops, but who should pay damages could not be decided; nor could they tell what the crop uninjured would have been worth. And worse yet was the complication, when several camps washed gravel into the same stream, or several gulches fed the single stream on lower land. All feeders brought rock waste, but no damage was done until the burdens were united in the slow-flowing stream. Yet something must be done. To let matters continue was to sacrifice agricultural lands and river channels as well, and to prohibit hydraulicking was to cripple the mining business and throw away millions of dollars invested in its development.¹⁸

Matters gradually took on another aspect, however, when it was really comprehended that the conflict between agriculture and mining was civil war; and in January, 1884, the California Supreme Court ruled that "private rights could not be encroached upon under

¹⁷ Patterson, R. H., "The New Golden Age, etc.," 1882, Vol. I, p. 262.

¹⁸ Bancroft, H. H., "History of California," Vol. VII, p. 648.

guise of miner's customs even in districts where statutes recognize validity of such local laws." Thus agriculture ultimately conquered, as it must surely do. Gold mining cannot survive without agricultural products, either local or imported. The business calls agriculture into existence, if at all possible, and because of dependence upon it, cannot effectually crush it. In Arizona and New Mexico, while the conditions for successful agriculture are generally at a premium because of the general aridity, many crops can be grown by irrigation. Such crops, because of their proximity to the mining towns and camps, would bring good prices. Fruit and vegetable farms located within convenient distance of such markets and supplied with irrigation facilities would be profitable, because advanced prices could be commanded. Of course such an item, in reducing the difficulties of mining this region, would promote the latter industry and in turn react on agriculture. The two industries cater to each other, and neither can be successfully arrayed against its helper without mutual loss.

Placer and hydraulic mining brought blessings also to the lands. The results were not all destructive. Broad alluvial flats were built up where nothing but worthless gravel or even less valuable bare rock existed, and these are now enormously productive. Many farms, temporarily inundated with muddy water, were renewed by a layer of fine mud sediment. Shinn asserts that "lands have as often been created as others have been ruined."¹⁹ It is probably rather strong, but it approaches the truth. In many places the great ditches, tunnels and canals, constructed for mining purposes and abandoned on the exhaustion of the placers, are now used for irrigation ditches. Ditches that could not possibly be constructed out of agricultural profits alone were easily launched by mining corporations, and now in several states are bringing their blessings to orchards and farms.

Thus in summary the presence of gold and silver mining in the West, which alone of all kinds of mining was best suited to survive in a new and distant land, stimulated and greatly encouraged agriculture as an associated pioneer industry. And the special forms of mining necessarily adopted, placer and hydraulic processes, because the glamor of gold gave the industry undue importance,

¹⁹ Shinn, C. H., "Mining Camps," p. 263.

overrode the rights of agriculture and seriously interfered with it. Had the gold been found in a region with other industries well established, this interference would not have occurred. And, finally, while the two industries, mining and agriculture, mutually aided and fostered each other, the above mentioned special processes provided enriched fields and irrigation ditches, which might be appropriated by agriculture and thus be made to contribute still further to the expansion of the latter.

Development of Transportation.—A great industry, whose expansion in the fifties may be attributed almost entirely to the precious metals, is that of transportation and its concomitant construction. World commerce with its existing means underwent rapid enlargement at once on the advent of gold into the list of western commodities. The Pacific, never before navigated for trade in any regular way except around the southern capes to India, was brought into requisition. Its vast area of public highway was used from Cape Horn northward to San Francisco, and from Puget Sound southward, and not only for men but for provisions. Transportation of supplies as well as men from Hawaii was greatly stimulated. The number of vessels from the Orient increased many fold during the first few years of the western awakening. And even down to the present oriental trade and communication grow rapidly with the development of the West, although the direct influence of mining proportionately decreases as the influence of other unfolding industries increases.

Land Routes.—On land the response to the demand for transportation facilities was sure, but laborious. We have seen²⁰ what it meant to transport the thousands of people across the continent in wagons, on pack animals and on foot. The problem of moving bulky goods was more difficult, and the increasing necessity of getting all manner of goods into the West in the fifties made any solution thereof inadequate as soon as it materialized. Organized pack trains of great heavy wagons drawn by multiple teams of horses or cattle were among the first responses. Many an emigrant loaded his wagon with merchandise, which he expected to sell when he reached California. The clumsy wagons drawn across country were often later put into local stage service. With a cargo of

²⁰ *Bull. Am. Geog. Soc.*

5,000–16,000 pounds and ten to twelve teams of oxen or mules, these vehicles crawled out of San Francisco, Sacramento or Stockton to the mines. In the south, and to a greater extent in the north, where roads were poorer and ravines steeper and more difficult, mule pack trains served the purpose.²¹

Express Companies and the Telegraph.—The heavy staging in California was rarely adequate to move the goods, and never safe for moving gold, nor was the government postal system of the interior sufficient for its business; so local express companies were organized both to carry the mail and to convey parcels. The federal postal system failed because of lack of pecuniary allowance for its maintenance in the midst of the gold-begotten high prices and enormous business. The express companies, private concerns with their management on the ground, came much nearer meeting the exigencies of the times. In 1853 there were twelve companies connecting with San Francisco.²² Two of these, Adams and Wells Fargo, were extensions or branches of eastern companies. The former failed in California, while the interests and operations of its successful rival have been very closely related to the gold and silver mining interests. Only the business and handsome compensation derived from gold mining made successful operations of express companies possible at that time.

Not only was the postal business rapidly extended in the West, but a more speedy means of transporting information was demanded. Nothing was too new or expensive for California. Telegraph lines came long before they would have come without the influence of gold, and have been multiplied from the very beginning. By the end of the first decade, many lines connected the camps and trade centers with the great hub of the West at the Golden Gate; and other lines connected the East with the West long before the railroads were in operation.

Water Routes.—The development of river traffic has been suggested previously. River craft very early plied the waters of every navigable stream in the Sacramento valley. Regular trips were made from San Francisco to Marysville, Coluca and Sacramento, the former at the head of navigation on the Feather, and the others at junctions of tributaries with the Sacramento. Navigation for

²¹ Bancroft, H. H., "History of California," Vol. VII, pp. 151–156.

²² *Ibid.*, VII, pp. 145–151.

provisioning mining camps developed as far up the Umpqua²³ River as possible. The extensive traffic on the Missouri and its western feeders due to immigrants to the mines and the movement of merchandise to the same destination is told by Chittenden.²⁴ This river transportation extended to the head of navigation on the Missouri, Fort Benton and built that town. The business became so great under the increasing demands, induced by the development of mining in Montana and Idaho, that it brought on its own destruction; for the large and growing need of transportation facilities called into existence the Union and Central Pacific, which took care of the trade in the southern and eastern part of the route, also the Northern Pacific, which captured all the Upper Missouri commerce and left Fort Benton little reason for being.

The Influence on the Development of Railroads.—Railroad plans for transcontinental lines were already made when the news of gold discoveries in California reached the Atlantic; but none had materialized, because of the clashing of northern and southern rights and of state and federal rights. Each faction feared, if a road were built across the continent where the other desired it, that the latter's gain would be detrimental to the former. None would make concessions for the common good. So in the conflict all routes in the United States remained closed until 1869. The Panama route was determined upon and surveyed, and the contracts let before the influence of gold mining reached the place. But during the first year or two of its construction the crowds of miners demanding transportation across the isthmus, interfered greatly with work on the new railroad by calling off most of the labor. In spite of this hindrance, and by the aid of the stimulating demand for transportation for the miners, road building proceeded; and the Panama railroad was completed in 1855.²⁵

Roads discussed in the United States were a northern, a central and a southern line which finally materialized respectively as the Northern Pacific, the Central and Union Pacific, and the two southern routes, the Santa Fé and Southern Pacific.

²³ Bancroft, H. H., "History of Oregon," Vol. II, p. 183.

²⁴ Chittenden, H. M., "Early Steamboat Navigation, on the Missouri River," 1903.

²⁵ Bancroft, H. H., "History of California," Vol. VI, p. 139. Otis, F. N., "The Isthmus of Panama," 1867, pp. 25, 36. Rodríguez, "The Panama Canal," 1885, pp. 10 f.

Federal land grants were relied upon to build the roads, but the demand for them came strongly from the Far West. Until 1848, the only route discussed in the North was that mainly coinciding with the Lewis and Clark route. The South became awakened at the accession of territory in 1848, and still more on the announcement of gold in it. They saw the possibility of a route across all southern soil and terminating in the gold fields. Thus the whole situation changed.²⁶ Asa Whitney, prime mover in the Northern Pacific scheme, proposed to terminate the line much farther north, where all earlier interests had been centered for a score of years. Now his plan was laid aside; and the South, plus the gold of California, constituted a force so potent that the terminus had to be in California. For a compromise, the line ran westward in the central part of the country. Another phase of the desire for a railroad to California had some influence in obtaining government aid. Under the impetus of its great wealth, the new West was developing very rapidly. It was cut off from "The States" by deserts, mountains and a long sea voyage, and it faced the free open ocean. Bancroft records that in 1860 there was talk of a political "cut off" and a new nation.²⁷ Californians felt that they had sufficient resources to go alone. But of course Congress, neither North nor South, would hear to this, so steps for railroad connection were rapidly taken. The route finally decided upon was, in the main, one used by the forty-niners and others later across South Pass, through Salt Lake City, Ogden, along the Humboldt and over the Sierras down Rio Americano to Sacramento and San Francisco. This terminal never would have been chosen had it not been for the interest centering in California's gold.²⁸ This line was built from both ends and was finished near Ogden, Utah, in 1869,²⁹ while the Northern Pacific was delayed until 1883. For a time during the discussions of route for the first railroad, the unequal pull or influence of various mining regions seemed likely to wreck all schemes; but better things came, and three distinct lines were constructed. A number of local lines in California and other states—stubs from the

²⁶ Humboldt, A. Baron von, "History of the Geography of a New Continent," p. 77.

²⁷ Bancroft, H. H., "History of California," Vol. VII, pp. 532 f.

²⁸ Hunt's *Merchant's Magazine*, Vol. XVIII, pp. 497, 592.

²⁹ Bancroft, H. H., "History of California," Vol. VII, p. 145. Smalley, E. V., "History of the Northern Pacific Railroad," p. 275.

main line to a mine—had been built before 1875.³⁰ A detailed map of any of the leading western lines of to-day shows clearly the marked influence of the distribution of the precious metals in the construction of the stub lines. Similar developments of branch roads appear in South Africa and Australia.

The Southern Pacific and Santa Fé, with a goodly number of stubs and short branch lines, are responses to the call of growing trade and mining business in California in part, but especially in Arizona and New Mexico. This latter region is abundantly supplied with the precious metals in nearly all parts, but there are few great deposits known at present. Transportation is perhaps the greatest problem. Lack of construction timber and fuel are serious difficulties in many places, but adequate transportation would overcome both. Valuable mines of gold and silver have been able successfully to demand a railroad to enter their vicinity; but lesser ones are unable to obtain the desired response and hence operate, if at all, against heavy odds.

It was not agriculture that called for railroads, because that industry was little developed when the roads came; but by their presence across the semi-arid region and through many attractive valleys, they have made possible settlements and the extension of agriculture, where both would have been slow to go but for the transportation facilities thus afforded.

Effects in Withdrawing Capital from Other Industries.—Much of the capital acquired by mining was expended in further developing the industry, invested in city property, or in developing other local industries. But this was not sufficient. Not only did wealth migrate from the mines into the industries and structures of the cities, but it came from the East into California, and later into Colorado, and now into every state. Nor did it flow in trickling streams into the mining industry. It came with prodigality and recklessness, and entered all industries, but especially those tributary to mining. Gold and silver mines have always had a secret cord on the purses of the people. Because of this influence over men and their stores, money had been withdrawn from almost every industry and put into stocks of gold mines, depriving the robbed industry of an equal amount of its earnings.³¹ Even the English have responded

³⁰ Bancroft, H. H., "History of California," Vol. VII, pp. 542-592.

³¹ Porter, R. P., "The West from the Census of 1880," p. 374.

with capital for American mines and often recklessly. So great is the power of attraction that millions have thus been removed from legitimate enterprises, both in eastern United States and in England, and sunk in western gold and silver mines. Not infrequently the properties thus endowed were wild-cat. Other millions have been wisely invested and are now paying good interest.

Influence on Technical Education.—Putting a broad construction on the term industry or occupation, it is possible to speak in this section of mining education and of mining schools of the United States. Of course, gold and silver alone should not be given all the credit for their development; but if the percentage of technical processes and of experts employed in mining the precious metals be compared with those in the whole mining industry of the country, these two metals will have a very creditable rank. Ours has come to be a mining nation, not because of a few abundant minerals, but because of many. Our rank in gold and silver has been first more than once in the last few years, but the place is interchangeable, first one of three countries leading, then another. We have attained this rank from almost the bottom of the list in about a half century, surpassing nations whose large output is the result of years of growth and long experience. Many technical processes and complex but adapted machines have originated in our mills because in them men have learned by experience what sort of combinations to use.³² By experiments in the Washoe mills alone, the ore dressing industry of the whole country has largely benefited; and the cost of training, however great, is inconsiderable compared with its importance and value to our mining industry. A great mass of technical skill and knowledge has been rapidly acquired. Schools with expensive equipment and large attendance have been established in several of our western states in the heart of the business, and others in connection with old institutions in the East. A great body of scientific and technical literature has accumulated. No nation grapples with mining problems in a more practical way and with more satisfactory results than does ours. No doubt, this is in considerable measure traceable to the abundance and variety of our gold and silver ores and the refractoriness of so many of the associations.

Summary.—In the words of Humboldt, “the influence of the

³² U. S. G. S. Monog., IV, p. 121.

mines on the progressive cultivation of the country" and the development of its industries "is more durable than are the mines themselves." Just as mining was a great and powerful motive for immigration, so it was, and is, for industrial development. It creates demands for the products of agriculture and manufacturing and thereby stimulates and expands both. It requires transportation, and often causes roads and railroads to be constructed against all but insurmountable obstacles. It has put the industrial development of the West decades ahead of where it could possibly have been in the normal frontier development, and given its commerce and manufacturing a distinctive tone. Further, it has stimulated nearly all industries throughout the country, increased their kinds of output as well as their quantity, and profoundly modified the distribution of hundreds of industries.

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THE INFLUENCE OF THE PRECIOUS METALS ON AMERICAN EXPLORATION, DISCOVERY, CONQUEST AND POSSESSION*

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EARLY EXPLORATIONS AND DISCOVERIES. Beginning with the first explorer who sailed across the Atlantic, "the expectation of finding a land rich in treasures of gold and silver or in products easily sold for the metals was the prevailing motive in the minds of most of the early discoverers and explorers." Whitney says‡ the sixteenth century travelers had little else in mind save the recompense for their toils and dangers in the rich mines of the precious metals which they were going to discover. Thus exploration was prompted by the desire for gold or for the lucrative trade in gold and spices from the Orient. The news of immensely rich empires, and mines of gold and silver ceaselessly attracted Spanish exploration and conquest into new quarters and thereby the more rapidly and extensively opened up the New World to the knowledge of mankind. The treasure was first found, in quantities, in the vaults and temples of the Indian civilizations both in Mexico and in Peru; but it was soon also discovered in the mines from which the natives derived it, and in others new even to them.§

Balboa, on the Isthmus in search of precious metals in 1513,|| found gold in the hands of natives and traded for 500 pounds of it. Cortez on the Gulf Coast of Mexico learned of the wealth of the kingdom of Montezuma, and marched successfully on his capital, destroying the natives in vast numbers in order to effect his purpose and get possession of the treasure. Pizarro is said to have extorted

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† Read before the Association of American Geographers, Baltimore, 1908.

‡ Whitney. J. D. *Metallic Wealth of the United States*, p. xxi.

§ Patterson, R. H. *The New Golden Age*. Vol. 1., pp. 422-424.

|| *Ibid.*, pp. 339-340.

from the Incas \$15,000,000 worth of gold and silver, partly by peaceable means, but with accompanying slaughter and pillage.* These discoveries were of prime importance as revealing metals already extracted; and they soon led to the finding of the sources.

The Spaniards wanted gold, silver, or anything which would bring the precious metals easily; and by all methods they acquired about \$250,000 per annum, chiefly gold, during the first thirty years (1492-1521). But during the conquests of Mexico and Peru, and for ten years thereafter, the acquisition of precious metals, now largely silver, rose rapidly to about \$3,000,000 per annum. So far, essentially all the wealth obtained by the Spaniards in America was gotten by conquest, plunder, tribute or barter. Practically no mining had been done prior to 1546, when the fabulously rich silver mines at Potosi in Bolivia were discovered, together with other mines of both silver and gold. And now, by forced native labor, and negro labor, the production of silver took another quick stride and rose to an average of \$10,000,000 per annum until 1600.†

Near the close of the sixteenth century, the Jesuits had spread across Mexico, gotten control of Lower California and discovered the pearl fisheries of the warm adjacent seas. Spanish settlers followed, and these discovered auriferous gravels, the southern end of that long line of gravel deposits extending north and south across the United States and Canada. Settlements grew, and agriculture began. The Indians harassed the settlers until their complaints brought a small army from headquarters, who pursued the Indians into the mountains and in 1771 discovered very rich placers.‡ Some 2,000 persons rushed in, within a few months, and the deposits were extensively developed. As in the case of California later, lack of provisions hindered development. It is interesting to note how near these developments led them to California, and how close they came to making discoveries that would have profoundly modified the course of history in the United States in 1846-48, and subsequently.

TWO MOTIVES IMPELLED THE SPANISH. In the course of events connected with the Spanish occupation of America two motives prompted action, motives often operating in the same mind. One was the avowed purpose of the religious orders to promulgate their religion among the natives; the other, the ceaseless attraction exerted

* *Ibid.*, p. 340; also Bancroft, H. H., *Mexico*, Vol. 3, pp. 571-2; Prescott, W. H., *The Conquest of Peru*, Vol. 1, pp. 433, 467.

† Patterson, R. H., *The New Golden Age*, Vol. 1, pp. 422-424.

‡ *Ibid.*, Vol. 1, pp. 347-350.

by treasure upon the military.* But, unfortunately, the Jesuits were sometimes influenced by the knowledge of the occurrence of silver and gold. While the chief missionary of a party may have had pure motives, his helpers often completely forgot their specific work and went where treasure bade them go. With this double motive, exploration and conquest rapidly disclosed the New World to the Old. It is not our purpose to trace the influence of the missionary spirit in America. As for the other influence, so far as it operated through the Spanish, and aside from the above mentioned results, its sole effects in America were the enriching of a comparatively small number of Spanish adventurers and the gorgeous maintenance of both Church and State. The commonalty suffered from two conditions, both born in part of greed for gold and silver,—a cramped and restricted trade, and the tyranny, despotism and avarice of officials.

EFFECTS OF GREED FOR GOLD AND SILVER. This very greed for the gold was one of the causes that operated to scatter the energy of the Spanish over Southern North America and all South America, and to prevent their developing cities or fixed industries. They conquered, primarily for its treasure, a territory larger than they could master and administer; and as a result, their occupancy was irregular and short lived over a considerable portion of their possessions.† The thirst for gold made the adventurers wild and led them a romantic career in the New World. They disdained agriculture, neglected singularly fertile plains, and thwarted legitimate commerce. They directed their steps wherever they heard tales of abundant treasure. And it was in these pursuits, so eagerly and mercilessly carried on, that they destroyed the native population and thus greatly lessened the value of their possessions by denuding the land of its native races.‡ Had this industrious and rudely cultured race of Indians been conserved and properly dealt with, the Spaniards might have had a loyal colony instead of a rebellious vassalage. And, further, the Indians might have lasted some time as tillers of the soil, if given careful and wise supervision, and thus have produced abundant harvests of products desired in Europe, thereby adding extensive and lucrative commerce to Spain's advantage. And what would have been Spain's gain, would also have been England's and America's.

HYPOTHETICAL CASES. Whether the absence of the treasure

* Bourne, E. G., *Spain in America*, pp. 170-175; Keller, *Colonization*, pp. 176-8, 203.

† *Ibid.*, p. 201.

‡ *Ibid.*, p. 271; Patterson, R. H., *The New Golden Age*, Vol. 1, pp. 337-8.

would have made the Spanish even endurable masters or not, is a question; but it is certain that, having once scented it, their avarice knew no bounds, and destruction and bloodshed followed in their wake. Had their course been so different as to have perpetuated their occupation of Mexico as long as they held Cuba, American history would have been quite another story. And with a loyal Spanish colony south of us as successful as the British Colony north of us, our history and development might have been considerably different. What has been said of the Spanish in Mexico applies in principle to the Spanish in Peru and Bolivia. We might have had more valuable neighbors in these countries. What might have been is hard to tell, but it is safe to assert that the conditions assumed above would have yielded results very different from those which have passed into history. Spanish power in America was intimately connected with the output of the precious metals. When the treasure flowed freely, Spain flourished both at home and abroad; and when it slackened, her power withered. Probably without the precious metals, her course would have been less offensive, and her influence less pernicious.

ENGLISH AND SPANISH COMPARED. South American mines were worked three-quarters of a century before there was an English settlement on the American continent. A century of Spanish exploration, gold hunting, christianizing and a kind of colonizing, in the South had been completed before the occupation of the northeastern seaboard began; then followed a century of settlement and exploration along the North Atlantic. While, in individual cases, some exploration and exploitation was done by the English immigrants in the vain hope of finding wealth in gold or silver, as colonists they were actuated by other motives. Not finding gold, they were not scattered through the mountains, but became much more of a solid unit than did the Spanish. Other factors, however, than the absence of gold operated against their becoming scattered. Since Spain had laid claim to so much of the South, the English, when ready to explore and settle, were restricted to the so-called less desirable parts.* Had there been easily gotten mineral wealth discovered in the Appalachian hills and valleys in the early days, there would have been a rush of adventurers at first, with fewer fixed and staid settlements. Perhaps it would have been roving Spanish, and not English, along the Atlantic coast. Hardships under the less settled conditions would greatly have surpassed those of the early colonists as it was,

* Keller, *Colonization*, pp. 178-80.

or even those of California in 1849 and 1850. One might well ask, what would our history have been had there been abundance of precious metals in New England and the Old Appalachians. Of course, ultimately the result would have been the development of the country; but its possession undoubtedly would have been different. Again, suppose the Spanish had not found treasure in the South. Well does Whitney* suggest, "How different might have been American history had there been settlements in the Mexican and South American States instead of silver." No doubt the distribution of gold and silver found response in the distribution of the nations in America in the early days. This is never more clearly seen than when the profoundly different distribution is imagined.

THE FRENCH. The French in America are usually thought of as a people with very slight predilections for the precious metals. They were led by other motives. But we are told that they explored extensively for gold and silver in 1719-20, about the junction of the Missouri and the Mississippi rivers, but, of course, with no positive results. Had they found the object of their quest in the region, the story of French exploration, occupation and possession would have needed another chapter.

SUMMARY TO 1848. Thus it becomes apparent that the desire for the precious metals was an active agent in the explorations carried on by the early voyagers; that the distribution of gold and silver led the searchers into nearly all parts of America south of the thirtieth parallel of north latitude, and aided in scattering the energy of the Spanish over too large a territory; that greed and avarice, finding a fertile soil in the acquisition of American precious metals, caused the Spanish to adopt and maintain a policy toward the natives and toward her colonists both cruel and pernicious; a policy, detrimental to the United States through our relations with Mexico; that the lack of gold and silver in the Appalachians has had an influence for good, especially on the English colonists, and through them on the conquest and possession of the northeastern United States; and that the finding of treasure and the increasing production of gold and silver have stimulated geographic exploration and discovery.

The amount of production of gold and silver continued to rise, and the cost to decline from time to time by the introduction of improved processes. It is stated that the production of gold and silver in the New World in 1800 had risen to about \$50,000,000 per annum. It is also known that the production of the United States

* Whitney, J. D., *Metallic Wealth in the United States*. p. xxi.

at that time was scarcely one-third of a million, and mostly gold, per annum; yet, indirectly, the production in other American States has aided the United States and has modified early American history perceptibly.

THE CALIFORNIA GOLD. Up to the discovery of gold in California the Pacific side of the continent had remained almost an uninhabited region save for the scattered Franciscan missionary posts; and unvisited except by a few scientific expeditions that crossed the desert and mountain wastes, by whalers who occasionally touched the coast, and by trappers and fur traders who moved up and down the streams and along the coast. The interior was visited even less. Knowledge concerning the whole region was very meager. The few expeditions brought back a little information concerning strips of country actually crossed, and the trappers and fur traders knew the courses of the streams, but the real opening up of the country and the discovery of its resources, agricultural as well as mineral, had scarcely begun in 1848. Transportation was very difficult, food all but wanting, water restricted to widely scattered points, and Indians were hostile. No advantages to be gained by crossing were known. The greatness of the uninhabited region required almost prohibitive provisioning of expeditions purposing to cross; and the pressure of population from the east had not yet reached a sufficient degree to push the frontier into the deserts and mountains.

But with the discovery of the wealth buried so slightly in the sands of the Sierras, was also found the incentive sufficient to induce men to brave the difficulties presented by a long land journey, or to risk the perilous voyage of six months around Cape Horn to reach the otherwise inaccessible California. Incidental to getting into California, more exploration of the interior was done in one summer than had ever been done before, and more than probably would have been done in the normal course of events in a score or two of years to come.

The fur traders had worked out many routes, but rarely did they point the way entirely across from the Mississippi to the Pacific. Fremont's report in 1845, embodying careful topographic and descriptive work, was a further contribution to the scanty fund of information concerning routes westward. The Oregon trail* was worked out, and used prior to the gold discoveries by several bands who later, in part, at least, figured in California. Perhaps the Sante Fé

* Parkman, Francis. *The Oregon Trail*.

trail* from St. Louis to Sante Fé, and the Gila and Spanish trails from there to southern California were as important as any of the older trails. These routes were almost entirely established prior to 1848, hence, their discovery can by no means be ascribed to the influence of this metal; but they were little known and little used save by the fur traders until 1849. During that summer trails became roads, and bridle paths highways, cut-offs were found, new watering-places discovered and in many ways the courses improved. The trail to Salt Lake City through South Pass was used; but, instead of going on northwestward to the Columbia and Oregon, a new trail was worked out down the Humboldt River to Humboldt Sink, then up the back of the Sierras, and down the many ravines on the western face. The route, a well-woven cord nearly to the eastern slope of these mountains, seemed to fray out into many strands leading down the gulches on the western side. The American River, down which Fremont traveled,† is fairly typical in the hardships presented. It is astonishing what difficulties men and even women and children will surmount when under the influence of the gold fever.

Mention must also be made of the exploration of routes, mainly by water, which came into use on the advent of California gold, and led from the Atlantic ports to Mexico and Central America and then by stream or on the land across to the Pacific, and thence to California. The route with the shortest land section crossed the Isthmus of Panama, and was found very early both by passengers and freight. Other routes crossed at Tehuantepec, Nicaragua and from Tampico across northern Mexico to Mazatlan and other Pacific ports, all resulting in the exploration of sections of the country, but, neither in occupation nor in possession, any more than the crossing of the arid plains and the mountains, resulted at first in their occupation. Routes discovered and developed by emigrants in search of gold at the end of their journey, differ in this respect from those worked out by the ordinary overland emigrant. Only the discouraged or exhausted halt on the former, while the latter soon become enlivened by settlements of those who find places "good enough for them" and turn aside to occupy.

EXPLORATION BY PROSPECTORS. This pioneer exploration, discussed above, took place during the early days of the gold excitement in California; but as the richer deposits became exhausted, the pros-

* Semple, E. C. *American History and Its Geographical Conditions*, Ch. X and XI.

† Fremont, J. C., *Report of the Exploring Expedition to the Rocky Mountains*, pp. 230 f.

pector set out, impelled by a continuous vision of "nuggets." He pushed back into the interior wilderness, across deserts, over ridges, into glens, gulches, parks, and long stately valleys; he climbed mountains, crossed divides and traced streams from end to end. While his explorations were not scientific, and his results were not recorded, his discoveries were valuable even aside from the treasure they revealed, because definite reports of his discoveries often got into possession of others; and the latter followed him out to make new settlements or to occupy fields which he had only viewed. And even in the absence of positive statement of valuable finds of minerals, lands, forest, or game, the report that so-and-so had been through certain valleys or over certain mountains or had been exploring in a named locality or direction, served to turn the attention thitherward, and make one feel somewhat acquainted with the places beyond his more complete knowledge. It all aided in the conquest of valley and hillside, spring and water course, to other purposes than the maintenance of wild animals and savages. Desire to find gold, and the reports of gold and silver found all over the West, prompted further exploration, and led to discoveries, not only of precious metals, but of many geographic features, streams, mountains, valleys, and plains, and of many other less attractive but more remunerative resources of the region. Under the powerful stimulus, exploration was very active, and the knowledge of the West extended phenomenally.

SCIENTIFIC EXPLORATION OF ALASKA. Nor should this section be concluded without reference to the influence Alaskan gold has had upon exploration. It played no part in the discovery, nor in our gaining possession of the peninsula, but since the announcement of its presence the exploration of the country by prospectors and miners, and by those who would enter the carrying trade to assist the miners, has been very vigorously pushed. In a much closer way careful surveying and mapping have gone on rapidly under the supervision of the United States Geological Survey, and at the expense of the Federal Government. Of course, this work is not done alone in response to the influence of gold and silver; but the distribution of the work both in Alaska and in the States shows how influential have been the mineral deposits in determining the areas to be surveyed first. Gold and silver have played an important part, as have other minerals.

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THE INFLUENCE OF THE PRESENCE, DISCOVERY AND DISTRIBUTION OF THE PRECIOUS METALS IN AMERICA ON THE MIGRATION OF PEOPLE*

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In a previous section† was traced the exploration carried on by the three leading nations in America,—Spanish, English and French. The exploring parties in some cases became so large and numerous that they really constituted a migration, a flood of immigration. It is difficult to establish a line that will properly delimit explorers and adventurers from immigrants, but for all practical purposes those who come and roam about with no intention of remaining in a place may be classed in the first group; those who come ostensibly to remain, even though not permanently in one place, may be put in the second group. A migration has the idea of mass movement and for a more or less permanent home, while the exploring party is small and never intends to abide.

SPANISH MIGRATIONS. Myers‡ speaks of the migration of adventurers and colonists from Spain to America in the Sixteenth

* This paper is a portion of the thesis presented as a part of the requirement for the Ph.D. degree in Geography at Cornell University. For other parts see this Bulletin, Vol. XLII, pp. 594-602; Scott. Geog. Mag., Vol. XXVI, pp. 449-466; Vol. XXVII, pp. 417 and 470; Bull. Phil. Geog. Soc., Vol. IX, pp. 1-22; Vol. X, pp. 36-50. Special thanks are herein expressed for criticism and suggestion given by Professors R. S. Tarr, H. Ries, and W. F. Willcox, throughout the whole work.

† *Bulletin*, Vol. XLII, pp. 594-602.

‡ Myers, P. V. W. *Gen. Hist.*, 1889, pp. 517, 518.

Century as to be compared only with that to California and the West in 1849 and subsequently. It was more scattered in destination, and less scattered in source. Moved by the stories of rich deposits, the desire for adventure and for a new home, thousands of Spanish and Portuguese took passage for the new continent. Because the treasure could be found in so many places, and because gold and silver had the greatest attraction, they occupied nearly all parts of South America and Mexico, and even established themselves in territory constituting at present southwestern United States. The mines in America, in these early days, drew no small part of their workers from the mines in Spain, although many of the laborers were Indians and Negroes; and, inasmuch as the precious metals were found well distributed over South America and Mexico, the colonists, scattered over all this region, have given an Iberian color to the life and activities of the whole territory.

ENGLISH IMMIGRATION. South American mines were worked nearly a century, before English immigration made a beginning on the North Atlantic coast and spread westward across the lowlands to the foot-hills from New England to Georgia; and, when the English immigration began, gold and gold hunting seem to have had little power over it. Other ends than wealth were sought. The men in that stream of colonists were almost uniformly in search of permanent homes surrounded by agriculture, lumbering, fishing, and the beginnings of manufacturing. How fortunate for these colonists that they found no gold and silver in the Appalachians, for probably, had they found deposits, their settlements would have been preceded by Spanish miners' camps, and their standards of life by those somewhat opposed to the arts of peace and husbandry.

Just as gold played no part in the immigration of the early English colonists to America, so the desire for gold was not the influence that led those waves of families and civilization across the eastern barriers and to the plains and prairies of the Mississippi Valley. Likewise, the expansion into the first row of States west of that great river, a growth partly antecedent to the discovery of gold in California, apparently cannot be traced to the influence of the precious metals. Nor can those several western movements which stretched to the Pacific coast prior to 1849, really be said to have had anything to do with gold. The Mormons were forced from behind to cross the great plains. The Oregon immigrants of 1843 were induced to go by the prospect of lucrative trade in furs. A scattered emigration from the eastern and central States sifted a

sparse population of hardy pioneers through the mountains or around Cape Horn into California, Washington, and Oregon. But the motive was *not* in the gold. The results of all this fragmentary and heterogeneous westward movement of the people played its part in 1849-1853, for, when the news of the brilliant discoveries along the American River went abroad, the response first began among those who had found their way into the vicinity for other purposes than gold digging.

LOCAL EFFECTS IN 1848. Californians were at first incredulous of the discovery, and for three months the news did not reach points outside the valley. Accordingly, the response did not begin until April, 1848. Then there began a cautious ingathering, which was quickly followed by an apprehension of the magnitude of the discoveries, a quicker dissemination of the news in ever widening circles and a hasty response to the influence of the finds. The widening circle of information could travel no faster than man could move from one place to another; hence, where geographic conditions made travel easy the circle enlarged rapidly, but on the Sierra side its expansion was greatly restricted. Consequently, the first rush of eager miners came from the California Valley and the limiting slopes of the mountains into the gulches of as many of the Sierra streams as were known to possess gold-bearing gravels. California-Americans to the number of 2,000 and California-Spanish-Mexicans and Indians, in the aggregate about 3,000, were at work by the middle of the summer. The population of the mining camps was varied, to be sure, during the first summer, but no more so than was that of California and the immediate vicinity at the discovery of gold, barring a few foreign sailors who deserted their ships in harbor. The cosmopolitan nature of the migration was a feature of subsequent years and not of the first. As soon as the news had time to get to Oregon, Northern Mexico, and the Sandwich Islands, after gaining credence near home, there started parties from these places, the Argonauts, Sonorans, and Kanakas;* and as the news of the discovery reached the far-off Peruvian and Chilian, so the response came quickly in considerable parties from each country.

So great was the excitement in the California Valley, and so contagious the gold fever, that few escaped the effects of the epidemic. The main valley in close proximity to the centers of influence was pretty well drained to the gulches before the close of the season of 1848. By June, three-fourths of the male population of San Fran-

* Bancroft, H. H. *Hist of Calif.*, 1884, 7 vols., Vol. VI, p. 71.

cisco had gone. *The Star*, of San Francisco, May 27, 1849, contained the following vivid description:

"Stores are closed, places of business vacated, houses are tenantless, various kinds of mechanical labor suspended or given up entirely,—everything wears a desolate and somber look, everywhere all is dull, monotonous, dead."

Newspapers ceased publication by June; town council and the sanctuary services ended; sailors, and even officers, and sometimes captains, left ship in the harbor. Mexicans and Americans were equally affected; townsmen and farmers equally impetuous; judges, priests, doctors, alcaldes, criminals and their keepers, soldiers and their officers,—all classes went. Towns and farms were equally depopulated all along the valley and coast to San Diego.*

GOLD AND SILVER PRODUCING REGIONS ARE MOUNTAINOUS. But beyond the valley on the east for a thousand miles lay mountains and deserts; and on the west, the sea. Few miners could come from adjoining territory. It was uninhabited. The gulches, themselves, and their placers were in the mountains, and the quartz veins from which these placers and essentially all others of the West were derived, lay farther up in rugged, wild, mountain masses. This topographic distribution is a result of the origin and nature of gold deposits. The metal occurs in veins and fissures, hence in regions of metamorphism, folding, and faulting; in regions where rocks may contain heated waters, often associated with intrusions or with lava flows, sometimes not yet cold.† Silver occurs in similar regions and for the same reasons. Inasmuch as rocks which have been subjected to these dynamic processes are metamorphosed and often thereby hardened, and as, with the crustal disturbances, uplift has also occurred, the country, favored with the precious metals, is usually rough, high, mountainous, and difficult of access. Reference to lists of producing States, and a comparison of these lists with a physical map of the United States, will make it clear that almost all the gold and silver produced in the country comes from two widely separated mountainous areas.

When the gold of the Southern Appalachian States was found, mining began in the midst of a well settled region, in which food-producing industries were well established, and men, although busy with other work, were right on the ground. Further, the deposits were not extensive; hence, far reaching migrations did not occur. But when the California gold was found, and, later, when both

* Bancroft, *ibid.*, pp. 59, 263. Shinn, C. H., *Mining Camps*, pp. 109-114.

† Am. Inst. Min. Eng. (1903), Vol. XXXIII, pp. 790f.

metals were discovered in other Western States, the newness, roughness, inaccessibility, and distance to centers of population had successfully restrained any considerable accumulation of people and any development of other industries. Consequently, the rich and extensive deposits, by virtue of their geographic position and associations, did not find at hand labor and supplies for their exploitation: and, when the news of their discovery went forth, it called out a great migration; a migration from distant regions where labor was more abundant.

EXCITEMENT IN EASTERN UNITED STATES. Word of the unusual stir on the Pacific did not reach the Atlantic coast until late in 1848, because of the great distance and difficult transportation; and, during the winter and early spring of 1849, the news was spread far afield, until by the close of summer of that year knowledge of the mining possibilities there had become world-wide. No such widespread excitement had ever been known before; and nothing so far-reaching and influential has occurred since, although just as great discoveries of wealth have been made. The sweeping force of the craze arose from the remoteness of its source, and the consequent novelty and wildness, and from the richness of the deposits compared with anything known before. It was beyond the dreams of the ancients.

As the fact took hold of the people in eastern United States, thousands determined to go. Whitney conjectures that within a few months, some 50,000 of the healthiest and most energetic young men of the nation were on their way to California. So strong was the desire to go, that many started by one of the sea routes before the winter was over; and as the weather permitted, others departed by the land routes, until almost every town throughout the Eastern States had contributed a representative to the great army now closing in on California. Whitney estimates that 100,000 reached the region during the year 1849, among whom were citizens of every State in the Union. The estimate was probably a little generous.* Land routes were popular and supplied as many miners as the sea routes, but not so continuous a stream; because most were pro-

* Whitney, J. D., *Encyclopedia Britannica*, 9th Ed., Vol. 4, p. 701. Shinn, C. H., *Mining Camps*, p. 109. R. H. Patterson (*The New Golden Age*, Vol. 1, pp. 108-9) estimates the white population of California, in 1850, at less than 100,000, and quotes the census of Nov., 1852, at 170,000 whites. Shinn (*Mining Camps*, p. 132) says: "In December, 1849, there were 53,000 Americans in California." and a few pages later, states that in 1849 35,000 persons came to California by sea, and 42,000 by land. Not many had left for other fields as early as the close of 1849. Perhaps as much credence should be given to Whitney as to Shinn, who presents considerable discrepancy in his own statements.

hibitively closed during the winter, while one might sail anytime during the twelve months.

LAND ROUTES. Overland routes had been known for years prior to 1848.* The fur traders had worked them out, and the explorers had mapped some of them; but it should be remembered, that they were not made for continuous traffic across the continent. The connecting passes and high level routes had not become well established because so little used. Even the well ordered trails, formerly used primarily for freight, now became great passenger routes.

A common starting point was at the elbow of the Missouri River, but several towns in the vicinity became outfitting towns: St. Joseph, Westport, Leavenworth, Ft. Kearney, Independence, Kansas City, and even Omaha became important commercial centers in the effort to meet the needs of the trade. The northern routes to Laramie and South Pass conducted rather more emigrants westward than the southern route to Sante Fé, probably because the gold was mainly in the northern half of California, and because the emigrants did not know, or at least realize, that a longer journey, but at a much less altitude, by Sante Fé might bring them to their desired grounds equally as soon. Possibly the aridity and lack of settlements tended to keep people from the southern route, while the recruiting station at Salt Lake City offered a chance to rest by the northern line. The routes followed by the land emigrants through Salt Lake City led through rugged mountain passes and over long desert stretches; and then, as the pioneers approached the eastern flank of the Sierras in the rush to be first into the coveted gravels, they began to scatter and thus were compelled to use poorer, less traveled trails both up the slopes and through the passes of the crest. Having passed the summit, they scattered down the gulches from the Pitt in the north to the Tuolumne in the south. This brought them first to the upper ends of the steep, deep, defiles whose floors farther down were auriferous gravels.

These northern routes were beset by Indians. As long as the migration consisted of the fur-traders and an occasional settler, the natives cared little; but when the glamor and attractiveness of gold brought thousands of prairie schooners sailing across their grounds

* Chittenden, H. M. *Early Steamboat Navigation on the Missouri River*, 1903.

Chittenden, H. M. *Hist. of Amer., Fur Trade of The Far West*, 1902.

Fremont, J. C. *Report of The Expl. Exp. to Rocky Mts. in 1842, &c., 1845.*

Lewis and Clark. *Explorations in The North West.*

Parkman, Francis. *The Oregon Trail.*

Semple, E. C. *Amer. Hist. and Its Geographic Conditions*, 1903.

in one summer, and when towns and roads and all that drives out wilderness crowded in and claimed their habitat, they became restless, then revengeful. It only needed the lack of watchfulness on the part of the government, whose attention was elsewhere at the time, to permit the outbreak of trouble and hostilities between the Indians and the settlers in 1862.

Those who came by the southern route past Sante Fé, along the Gila River or the Spanish Trail, and across the Colorado River at Yuma into Southern California had to endure more desert, found a warmer climate, less rainfall, less forest, and had no great altitudes to traverse. They came into the California Valley and swung northwestward through the tule-covered swampland, or along the western foot of the mountains, and entered the gulches at their lower or western ends. They were led through territory already appropriated by Mexicans; and after the first summer, had not only the wicked Apache Indians to watch, but also the outlaw or the expelled Mexican miner who frequented these roads and robbed the traveler. Returning miners who presumably had in possession at least samples of California's treasures, proved most fascinating bait. Robbing became quite a business under the superior temptation presented by the returning miners, or by those going to new fields with their accumulated wealth in their belts. And not only was robbery committed, but occasionally entire parties were put out of the way by outlaws lurking in the defiles through which the caravan must proceed. In California, express companies abandoned their routes, because their goods so endangered the lives of their drivers. Robbing and murder were not local features but occurred on most of the trails and even on the highways between the mines and their trading centers.

The water routes worked out under the lead of gold were varied; but those broken at the Isthmus gave at least a possibility of a shorter time period than either the overland or Cape Horn route, hence they were always overcrowded. Until 1855, when the Panama railroad began duty, more emigrants, bound for California, arrived at the Atlantic ports than Isthmian transportation could be found for; and many more succeeded in crossing and reached the western ports than could find passage on the Pacific vessels to California, partly because so many Pacific ships were tied up at San Francisco. Consequently hundreds, probably thousands, were delayed between the two oceans, and became the prey of malarious diseases, which they were often unable to shake off, and therefore were never able

to grasp the gold they were seeking. A goodly number sailed around Cape Horn; and in these long journeys, subsisting on improper food, ran the risk of scurvy to which many fell victims. By December, 1848, the stream of emigration had become a rush. Ships were loaded at almost every Atlantic port. Vessels were drawn from the whaling business and from all kinds of trade greatly to the disarrangement of other commercial lines.*

GOLD CREATED GREAT MIGRATION. When one compares the small trickling stream of migration to the Far West prior to 1848 with the mighty river which surged through the passes and deluged the deserts between 1849 and 1856, he arrives at an expression for the magnitude of the influence emanating from the California gravels. Nor should the numerical response alone be taken as the measure of the influence. The obstacles to overcome, because the gold occurred in a far away mountain wilderness, were gigantic; over 3,000 miles by land for the far easterner; 2,000 miles for the prairie farmer; deserts, sand and dust, mountains and forest, snows and exposure, three or four months of severe hardship and privation; or, if by water, exposed for as long a time to dangers by sea; the sacrifice of home and its associations and comforts; the denial of friends, business and pleasures; and finally the expense of all this journey with only a hope at the end. Truly, tremendous, must have been that power over the lives of men to induce such enthusiasm and excitement, and to make men willing to submit themselves and often their families to such hardships. Chittenden† justly styles the movement as one of the most wonderful migrations of people on record.

Those going by sea were almost entirely from the coast regions, while those of the interior waited for spring to open up the land route. The response was strongest throughout the great Mississippi Valley, perhaps, because many of these people had moved once within the generation and were thus more susceptible to the moving fever than those farther east; perhaps, because they were nearer the gold fields.

Yet not only did the people of the eastern United States catch

* H. H. Bancroft (*Hist. of Calif.*, Vol. VI, pp. 121-5) gives the following figures attesting the volume of emigration from Eastern United States by sea: From six Atlantic ports between the dates of December 14, 1848, and January 18, 1849, 61 vessels carrying an average of 50 persons set sail. In the month of February, 1849, 60 vessels weighed anchor in New York Harbor loaded with California passengers, and 70 more in the harbors of Boston and Philadelphia. During the winter of 1849-50, 250 vessels sailed from Atlantic ports for California, 45 of which arrived in San Francisco Bay on the same day.

† Chittenden, H. M. *Early Steamboat Navigation on The Missouri River*, 1903, Vol. I, pp. 173, 4.

the gold fever and respond to the call; but, in the latter part of 1848 and during 1849, some 2,000 immigrants reached California from Oregon and Washington; and by July, 1849, 15,000 foreigners from Mexico, Chili, Peru, and other Pacific States had arrived. New Holland, Australia, the Marquesas Islands, and even China each sent its quota. Just a year from the discovery of gold, a flood of European emigrants, mostly British, arrived to try their fortunes.* In fact, nearly every civilized land was represented in the diggings of California during the course of the first five years. The Southern Appalachians happily sent to the West many men who knew the processes of placer mining, and found in California a larger freedom in which local mining institutions were rapidly developing.† European mining regions sent squads of miners trained in conservative methods of mining and disciplined in knowledge of camp life and organization, who contributed both to the common fund in their adopted country. Many miners from the south brought along a few negroes, thus adding another element to the ample heterogeneity of the mass collected around the mining centers of California.

Japan's stolidity under the almost universal excitement is somewhat remarkable; but it is asserted by Bancroft‡ that she was almost absolutely indifferent to all the world's bustle and flurry; and the almost total absence of the Japanese from California until many years after bears silent testimony to his indifference. With China, the case was very different. Either in direct response to the influence of gold in the rocks, or else with a desire to engage in some other business than mining, but tributary to it, her people came; 3 in 1848, 700 in 1849, over 3,000 in 1850, as many more in 1851, and about 10,000 in 1852, so that by the opening of 1853 at least 20,000 Chinese were in the State. Then the incoming rapidly declined.§ A great many arrived from the Hawaiian Islands and easily became the menial class. They were accustomed to it, and were willing, when there arose a need for such work, to be laborers of the lowest class. Moreover, the fact that gold had been acquired with simple, cheap equipment; and that no one had been able to hire laborers in the placers for what such laborers easily ran the chance of making when working for themselves, had given rise to a uni-

* Patterson, R. H. *The New Golden Age*, 1882, Vol. I, pp. 104, 5.

† Shinn, C. H. *Mining Camps*, 1885, p. 40.

‡ Bancroft, H. H. *Hist. of Calif.*, Vol. VI, p. 124.

§ *Ibid.*, Vol. VII, p. 335 f; Semple, E. C., *American History and its Geographical Conditions*, 1903, p. 319.

versal aristocracy with no true laboring class. When, owing to changed mining conditions, such a class became necessary, the ports of China were nearer in time, expense, and hardship than were the Eastern States, hence the Chinaman stepped in and became the common drudge.*

Prior to the discovery of gold in California, the Spanish-Mexicans were coming into the valley in greater numbers than the Americans. The query might well arise, would this condition have continued, had not the new mining industry invited the thousands to immigrate? And had it continued, would not the Americans, when the time came for their expansion, have found little desirable land unoccupied? The discoveries seem from this point of view to have been very timely.

INCREASE OF POPULATION. No statement of the increase of population in California will portray the phenomenal growth better than can be done with a few figures. Each year before 1848, a few had come until, by the summer of 1845, just prior to any emigration which could possibly be ascribed to the influence of gold, the State contained 2,000 Americans and as many Mexicans. In December of the same year there were 6,000; in July 1849, 15,000 and in December, 53,000. In June 1850, the total white population was 92,597 and in November, 1852, according to the census taken that month, it amounted to 269,000, of which about 30,000 were Indians, 20,000 Chinese and 2,000 negroes.† The center of population in the United States migrated 81 miles westward during the decade 1850-1860, the movement being about 50 per cent. larger than that of preceding decades, and a result of the emigrating impulse that was filling up the far western territory.

This same phenomenal growth of population has been witnessed in most of the newly discovered gold regions. In Alaska, the Nome coast furnishes an illustration where the conditions were even harder to meet than those of California. On January 1, 1899, a few Eskimo huts and one or two sod houses for white men were the only human habitations along 60 miles of coast. In June, a dozen or score of tents housed the entire population, and in October, 5,000 whites were dwelling on the beach.‡ Another illustration comes from Australia. Gold was discovered in Victoria in 1851. Previous immigration had been rapid, but at this time it took a sudden

* Semple, E. C., *loc. cit.*, p. 320.

† Patterson, R. H. *The New Golden Age, &c.*, Vol. I, pp. 108-9. Shinn, C. H. *Mining Camps*, p. 132. Abstract 12th Census of the United States, pp. 32-33.

‡ U. S. G. S. Prelim. Rept. on Cape Nome Region, Alaska, Brooks & Schrader, p. 45.

leap. In 1846, Victoria contained 33,000 people; in 1851, 51,000; and in 1854, 236,000.*

OTHER EFFECTS ON POPULATION. This rapid growth in the number of people was not the only effect of the precious metals on the population of the West. Society was masculine, and most of the men were under forty years of age. Only men of youth and vigor could make the journey or bear the privations and exposure of camp life. Wisely, the selection in the main occurred in the homes, and only the young, healthy men started. The novelty and wildness, the adventure and risk of the journey and of mining, appealed to the young men more than to those who were rooted in business or family. Shinn† says there were but 15 women in San Francisco in the Spring of 1849. There were many camps with none at all, and others containing but one family among, say 40 single men. Perhaps the inequality of the sexes numerically was greater among the Chinese than among any other nationality. In August, 1852, not one in a thousand among them was a woman.‡ Bancroft, after discussing the manliness and strength of character of the men who came under the influence of gold mining camp life, remarks that "the comparative superiority of the men over women is an expression of the law that the power of attraction due to gold and silver does not tear away from civilized and cultured comforts the same select grades of both. Nor do the mining habits develop the same admirable qualities in women as in men.§ Even in the report of the 12th Census 1900, there is shown a remarkable difference in the number of men and of women in the mining States of the West, a condition not entirely due to the mining industry, but partly to the fact that these States constituted a part of our frontier. Table I summarizes the population conditions in the mining States and Territories and in some others. In Arizona, Idaho, Montana, Nevada, Wyoming and Alaska mining constituted a larger per cent. of the total industries of the region than in the others, and here the largest percentages of male population were found. In Utah, although mining constituted a considerable portion of the business, religious influences kept the percentage of males lower than in any other State west of the Mississippi, except Louisiana. Nevada presents an interesting example. In 1880, her population was 62,266; and it has been declining ever since, while the percentage of females has been increasing. The declining industry through these

* Nicholson, J. S. *Effects of Great Discoveries of Precious Metals*, 1887, pp. 38-9.

† *Ibid.*, p. 137.

‡ Bancroft, H. H. *Hist. of Calif.*, Vol. VII, pp. 335f.

§ *Ibid.*, p. 715.

twenty years is that of mining. It seems probable that the miners who are going to other places are single men, while the family men in other occupations are remaining. If this be true, it emphasizes again the law that the precious metals attract for workmen, single men. Should it be charged that these western mining States possess a high percentage of male population, simply because they are on the frontier, the answer comes from all the States not engaged in this kind of mining whose settlement has taken place mainly since California began to be filled up, and which may, for this reason, be considered pioneer States. Table I, part B, summarizes the con-

TABLE I. POPULATION OF GOLD AND SILVER MINING STATES
CLASSIFIED BY SEX.

STATE OR TERRITORY.	POPULATION 1900.			PERCENTAGE.	
	MALE.	FEMALE.	TOTAL.	MALE.	FEMALE.
<i>Part A</i>					
Western Division....	2,297,732	1,793,617	4,091,349	56.2	43.8
Arizona.....	71,795	51,136	122,931	58.4	41.6
California.....	820,531	664,522	1,485,053	55.3	44.7
Colorado.....	295,332	244,368	539,700	54.7	45.3
Idaho.....	93,367	68,405	161,772	57.7	42.3
Montana.....	149,842	93,487	243,329	61.6	38.4
Nevada.....	25,603	16,732	42,335	60.5	39.5
New Mexico.....	104,228	91,082	195,310	53.4	46.6
North Dakota.....	177,493	141,653	319,146	55.6	44.4
Oregon.....	232,985	180,551	413,536	56.3	43.7
South Dakota.....	216,164	185,406	401,570	53.8	46.2
Utah.....	141,687	135,062	276,749	51.2	48.8
Washington.....	304,178	213,925	518,103	58.7	41.3
Wyoming.....	58,184	34,347	92,531	62.9	37.1
Alaska.....	45,872	17,720	63,592	72.1	27.9
<i>Part B</i>					
Indian Territory.....	208,952	183,108	392,060	53.3	46.7
Kansas.....	768,716	701,779	1,470,495	52.3	47.7
Minnesota.....	932,490	818,904	1,751,394	53.2	46.8
Nebraska.....	564,592	501,708	1,066,300	52.9	47.1
Oklahoma.....	214,359	183,972	398,331	53.8	46.2

ditions in five of this class. The disparity of the sexes is less than half as great in these five as in the eleven western states and territories excluding Alaska. Inasmuch as Oklahoma is by far the most newly settled of all, one would expect to find it approaching California; but while it has the greatest inequality of any of the five, it is as far from California as from Kansas, the state of the second group having the minimum inequality.

The population in California did not increase as fast as immigration might seem to warrant, because of emigration from the State to new gold and silver deposits, and because a reaction in mining matters set in after about five years of rush and excitement. The mania had run its course and was abating. It was influenced slightly, too, by a counter attraction in the Appalachian mountains.

There began about this time a general search for gold throughout the eastern mountains. Many men engaged in it; and under the stimulus of Western excitement, mining, as well as prospecting, revived in the East, although the output was rather decreased at first by the movement westward and did not recover for ten years. Another reason why California's population grew slowly after 1853, is found in the compulsory exodus of a large number of Mexicans and half breeds to Mexico; an expulsion deemed necessary, because the lawlessness of the Mexican had been much aggravated by the conditions in which the mining had placed him; and made possible, because there had responded to the call to come West so many more men from the States than from the south. The foreign population from the south, however, was only expelled when its character made it an undesirable element.*

PROSPECTORS AND RUSHES. The development of mining evolved the prospectors, whose whole purpose seems to have been to roam about and unearth new deposits of treasure. They scattered from the camps up the sides of the gulches, across divides laterally and down into parallel valleys, or out at the upper ends of valleys and down the eastern Sierra slope. Thus other gulches and their contents became known. Men worked their claims, and told or wrote to their friends what they had found, or so described it that similar deposits were identified elsewhere. Other men came to visit the mines and camps, and after a little examination declared that they had the same kind of stuff at home, and forthwith proceeded to prove it. By these exploratory wanderings the extent of the gold fields of California became known.

The prospector wandered out of the State and into others, made magnificent finds, or told of finding magnificent things; and immediately there were swarms of men, urged by strong desire, who were ready to leave sure things for the possibility of something richer. By this means there arose many local or even inter-state migrations of considerable bodies of men. Whole camps became fired with something akin to the feeling in the bosom of the roving prospector, but differing in that they knew where they were going, while the prospector never knew. Hundreds of rushes of men from one gulch to another occurred, thus scattering the miners in all directions. Camps often sprung up, mushroom like, in a night, and flourished a few months or even a year or two, and then were left deserted and abandoned, because the builders had taken a new attack

* Whitney, J. D. *Metallic Wealth of the U. S.*, p. 137.

of the gold fever. While such frequent moves were usually disastrous to many of the participants, they were factors of progress; and their final result was an ever widening benefit to the state and society, because they increased knowledge both of land and mineral; they mixed men in their period of rapid transformation and prevented local sectionalism; they diffused knowledge of methods of mining and reducing the ores; they acquainted men with several conditions under which the ore occurred; and in many ways made for the improvement of the industry and the more uniform development of the whole western region.

Examples of significant or extensive migrations by means of rushes are easily found and date from the beginning of the history of western gold mining. No sooner had the development of California's wealth gotten well under way than such emigration began. Sometimes, the particular provocation was a report of a promising bonanza, based on some prospector's discovered "traces of gold;" sometimes, it was a day's or week's hard luck in the home beds that sufficed to send forth the restless miner. In the Fraser River rush of 1858, 15,000 hardy men left California in four months, and other thousands later.* In the following year, thousands went to the Cariboo B. C.; and in 1860-1862, a multitude hastened to Idaho on the Clearwater and Salmon rivers. The Washoe rush occurred at the same time. During 1860-1862, Nevada sagebrush deserts and treeless mountains proved attractive, and California miners began to gather treasures from Humboldt, Esmeralda, etc. In 1862, a rush to Boise, Idaho, occurred;† in 1863, to Owyhee; in 1864, to Alturas; to Big Bend of the Columbia in 1865, and to White Pine in 1866. California lost to these regions in the last three or four of these years 30,000 to 40,000 men. Nor did all in each new place come from the one State; for the later rushes were made up in part of men who had become accustomed to rush, and in part of men fresh from the East, as well as of those who were leaving California for the first time. Rushing into new territory was not confined to the early days but continued down to the present century. Nor was it a feature of American mining; for Australia, in the fifties, had many wild, exciting rushes and occasional examples all along, until the famous West Australia excitements in the nineties, of which the Siberia rush was perhaps the most notable.‡ Klondike in the later nineties, and Nome in 1899 and 1900 with Thunder

* Bancroft, H. H. *Hist. of Calif.*, Vol. VII, pp. 682-3.

† Bancroft, H. H. *Hist. of Wash., Idaho and Montana*, pp. 406f; 418.

‡ *Amer. Inst. Min. Eng.*, 1898, p. 496.

Mountain, Idaho, in 1901-2 bring the rush down nearly to the present. The surficial nature of the gold occurrence in placers seems directly responsible for this peculiar character of migrations. Quartz deposits do not elicit the phenomenon, because it takes capital and machinery to get anything out of them, and the single handed miner with rapid development ideas can do nothing. In this shifting about, many became discouraged with mining and turned to other occupations, as they found suitable localities for grazing or cultivating. Almost all occupations were recruited from among the miners, as they had contributed to that class.

Rushing not only gave an impetus to all the Western States, but by this form of migration miners overflowed into British Columbia and even into Northern Mexico, teaching the Mexicans better methods of working. They affiliated with them, fought Indians for them, and prepared the way for closer international relations.* The wandering miners even spread into South America, Alaska, Australia, and the Transvaal, from all of which our own Western States have now received miners; and carried with them their laws and customs as well as methods of working. Often the transported Yankee mining notions were unworkable in the new conditions; but the ingenuity, which responded to the former conditions, was again sufficient to devise something that would work, and so the diffusion of ideas went on working beneficence all the way as surely as did those Crusades of the olden days.

REFLEX WAVE OF MIGRATION. The fact that the first great discoveries of gold and silver in the United States were very near the western coast, and that subsequent disclosures were made at varying distances inland, led to the reflexing of the wave of migration and development. All focussed on California for a few years; then other discoveries were made, in Oregon in 1852, Washington in 1855,† with Arizona in 1858, Nevada in 1859, and Idaho in 1860 or 1862,‡ completing the semi-circle around the first State. Colorado, a little out of time, was found to be rich in gold in 1859 by men enroute to California; and there followed a rapid immigration from the West as well as from the East. Other valuable deposits were revealed in Idaho in 1861 and 1863. Montana started the second semi-circle in 1860 and 1862, and possibly in 1858, which New Mexico in 1860, and Utah in 1867 completed. Then came the outposts of South Dakota in 1876 and Alaska in 1880. The dates of

* Shinn, C. H. *Mining Camps*, pp. 291-2.

† Bancroft, H. H. *Hist. of Wash., Idaho and Mont.*, p. 108.

‡ *Ibid.*, p. 406. Eggleston, Edw. *United States and Its People*, 1888, pp. 75-77.

admission to statehood confirm this truth and illustrate still further the influence of the mining industry. California, the first western State to receive the honor, entered the Union in 1850. Oregon and Nevada, two adjoining States, followed in 1859 and 1864, respectively. Although Utah's population was sufficient before 1870 to admit her with her semi-circle, for other reasons she was detained until 1896. In 1889 and 1890, the second semi-circle, begun abnormally by Colorado in 1876 (already an important mining State), was completed by the admission of Wyoming, Montana, Idaho and Washington. South Dakota was admitted in 1889, also, but not primarily on account of the mining population. Arizona, due in the sixties, and New Mexico due with Idaho and Wyoming, did not gain statehood until a very recent date. Their interests, although mostly mining, were relatively slight; and their populations consisted, beside the miners, mostly of Mexicans and Indians. As the widening waves of discovery spread from California as a center, so the wave of migration set in the same direction; and in the course of thirty years, with constant additions from the East, had beaten back across all the mountains, setting in motion the machinery of development in every State.*

* Chittenden, H. M. *Early Steamboat Navigation on The Missouri River*, 1903, Vol. II, pp. 265f.

THE PRECIOUS METALS AS A GEOGRAPHIC FACTOR IN THE SETTLEMENT AND DEVELOPMENT OF TOWNS IN THE UNITED STATES.¹

By GEORGE D. HUBBARD.

Classes of Towns and Settlements.—In other papers the relation of the discovery and distribution of the precious metals to the movements of the people has been discussed,² movements both for the purpose of exploration, and of engaging in more or less fixed occupations. Here, the kinds of habitations and settlements, and the nature of the community groups formed where the influence of gold and silver was strong, will be treated. There were in the mining regions of the West camps and towns of all degrees of permanence, from the group of tents, staked for one or two nights' lodging, to the substantial and well-ordered city. There were mining camps, commercial centres, and out-fitting stations, and towns and cities primarily for other purposes than to minister to the gold and silver mining industry. And not only the camps and towns, but the distribution of people and the character of rural settlements often show the effects of gold- and silver-mining. Probably every hamlet, town, and city in the whole West has been more or less modified under the powerful touch of the precious metals. Many would never have been at all; others would not have been so great; and possibly a few would have been of more importance; but each certainly

¹ This paper was prepared as a part of the requirements for the doctor's degree in geography at Cornell University. Thanks are hereby given to Prof. R. S. Tarr, Prof. W. F. Willcox, and Prof. H. Ries, whose valuable suggestions aided in giving it any virtue it may possess. [It was also submitted to Section E (Geography) at the Winnipeg Meeting of the British Association (cf. vol. xxv. p. 579).—Ed. *S. G. M.*]

² *Bull. Amer. Geog. Society*, vol. xlii., 1910.

bears, in its character and development, marks of the moulding influence of this powerful industry.

A number of causes operated to determine the nature and life-history of a miner's settlement. Its purpose probably functioned first. If it was to be a camp in a gulch, whither men had been collected hurriedly to wash auriferous gravel, the signs of permanence were few or entirely wanting; if it was a centre of extensive or expensive mining of complex ores, it had to be more enduring; if it was to be a provisioning centre for a group of diggings, it took on a somewhat fixed character and was classed as a town; if it was to be a commercial centre and the outfitting headquarters where new arrivals by land or water were to enter the region, its buildings were of a still more substantial kind, and its plan better worked out. But the first classification has not always been maintained. Founders' plans have often gone far astray, because not in harmony with the conditions.

Conditions and Character of Camps.—Camp conditions have been portrayed by many writers from earliest mining days to the present.¹ In some respects the conditions differ widely then and now, owing partly to differences in the kind of men who come to the camp; but in many respects there are characteristic resemblances. Placer mining conditions will be treated first, hence the following paragraphs are more applicable to the earlier mining days. Shelter was nothing more than shelter of the simplest kind; even rude houses in the early days were rarely built; but in recent times adjacent saw-mills make them possible in many places. The flimsy board shanty, the tent, stakes with a canvas cover, booths of branches, and often simply the thick branches of a standing tree, were all the miner took time to construct or appropriate. The warm and, for the most part, dry climate of California, where the gold first called for dwellers, made it possible to live with almost no shelter in summer, while severe winters sometimes drove the miner entirely out of the gulch. The shelters stood right in the gulch, or along the bar that was to be mined, as near as might be to the work that was to be done; sometimes in the way of future operations, sometimes arranged along a single street or path, sometimes irregularly scattered along the side of the valley. Planning a camp was usually not thought of. The men were too full of the present to plan for the future, and of self to think of the convenience of orderly construction. Their equipment consisted of a blanket or two apiece for the occupants, a frying-pan and a few other culinary or table utensils, a few boxes, bags or bundles of eatables, and, after matters were started, an empty box or two.

The element of camp permanence was at first very small in any locality, especially in the early days. This grew out of several conditions. The first work was usually done on gravels or ledges whose output was uncertain, and whose quantity of pay-dirt or ore was never known until it was practically exhausted. Men expected to mine what

¹ T. A. Barry and B. A. Patten, *San Francisco in the Spring of 1850*, 1873. H. H. Bancroft, *History of California*, 1884. 7 vols. Bret Harte, *Many Poems and Stories of Western Life*. See Works. C. H. Miller (Jochain), *Poems*, 1882. Bayard Taylor, *Eldorado*, 1857.

was there, and move on. Then the miners were anxious to make the most of every moment. The time lost in building a house put one far in the rear. A third reason was the excitement induced in most camps by the gold. It was not a matter of reason whether to build or to mine. Hardly any one who entered a camp could keep from using a pick and shovel. The temptation to mine was too strong to be resisted for the sake of a little more present comfort. Fourth, the great disparity of the sexes, a fact already traceable largely to the geographic conditions under which the gold occurred, was in turn a cause of the spirit of unrest and the free movement from place to place. If a single man thought he could do better elsewhere, he was free to go and try. Again, the simple methods of mining, begotten of the conditions of occurrence, favoured, for two reasons, the moving about from gulch to gulch. In the first place, throughout the California placers the conditions and requirements were so similar that no one need stop after moving to learn new methods. Secondly, for placer mining one's whole outfit could be tied up in a blanket and carried to a new place. This condition disappeared when the more complicated processes came into use, but in the early history—in the placer stage—permanent settlements were almost out of the question. And had there been only placer deposits, the boom of any State or region would have been ephemeral.

There was little division of labour. Nor was there a labouring class; everybody was a proprietor. Because education and experience counted for little—so simple was the mining process, and so blind the clue to rich pockets—professors of geology, newspaper men, lawyers, physicians, sailors, masons, accountants, and farmers, all worked side by side. Because of this same simplicity in mining process, and the opportunity for any one to "strike it rich," the poor man preferred to work independently and run all risks rather than to hire out and thus be sure of what the rich man was able to pay. And the rich man was compelled to work himself because he could not afford to hire. He could not pay what the labourer with his chance for success thought he could make alone. All this, with the common risk and speculation and the universal gold-begotten excitement, tended to produce the social equality of the camp, so marked a feature of the early California days.

In spite of the social equality, however, some division of labour arose early. Those who had an eye to business, and were willing to forego the thrill of plucking the yellow rock from the gravels, and at the same time to avoid the exposure incident to actual mining, engaged in other occupations as essential to the success of the camp as mining, and often more certainly lucrative. Some entered the carrying trade. A man and a mule sometimes made \$3000 in a month. Three Yankees established a ferry across the San Joachin river, and took from \$500 to \$1000 daily. They charged \$2 for carrying a man and horse across.¹ It was not extortion to charge such prices and reap the reward thereof. The miners were making money as rapidly and were perfectly willing to pay. The shrewd non-miners simply hit upon an occupation for which the condi-

¹ Bayard Taylor, *Eldorado*, 1857, pp. 75, 98.

tions gave a ready market. Keeness for gold was an element of the atmosphere in which society moved.

Frequently one member of a camp ran a gambling establishment, and every town had an abundance and variety of gaming-tables. After 1848, robbers, camp-thieves, horse-thieves, and lawless characters were to be found, but Shinn¹ says that there was probably less crime in California during the first summer than in any summer before or since. This fact has been attested by a number of writers, and is probably due to several causes. Most of the men were near home, and were among friends and neighbours; the foreign elements had not yet arrived, because the influence of the metal had not yet gone far. An excitement, a sort of spell, was over the region. The fascination and witchery of gold-mining held universal sway. Every one was anxious to see what would develop. He preferred to be out knocking about in the ravines to find a bigger pile than his neighbour, than to be robbing him of his find. Then, too, theft was made a capital offence in many districts. It was very easy to take a thousand dollars from the gravel, and many times safer than to take it from some miner's tent. Further, there was a romance in recovering such valuables from the stream-beds. It is no wonder that there was so little theft during these early months.

Owing to the freedom and the independence of endeavour in the mining camps, each man's will and power was his law. Disputes and quarrels, even duels and murders, occurred in the camps, but were not common. As a rule the early camps were much more peaceable than would be expected. In recent times lawless tendencies are even less violent than in the fifties. Two reasons seem to explain the fact: (a) Law and order are not now in the hands of the camp, but are functions of the State and local civil organisation, because these institutions have had time to develop over most of the West; (b) Camps as such are largely replaced by towns gathered around some huge mining and reducing plant, which location gives the place a feeling of permanence and security. Of course, many times the rough brute side of human nature displays itself vehemently, but respect for law by loyal citizens is the rule not the exception.

The tendency to fast living, a product of extreme optimism and unbounded faith in mining, is still found in mining camps and towns; but it is not so strong as in the early days in the newness and wonderfulness of the whole episode. Men made their money easily and rapidly; they were in the exuberance of young manhood. They were away from family, and even civil restraint; they were excited, feverish, often delirious with the infatuation for gold, and were not themselves. Besides, the tendency to fast living often expressed itself in drunkenness and gambling.

Special Types of Camps.—Special local conditions gave rise to camps of peculiar character. The Southern Appalachian region and places in the arid region will illustrate this point. In Georgia and the eastern

¹ C. H. Shinn, *Mining Camps: A Study in American Frontier Government*, 1885, pp. 119, 120.

States generally, the gold was discovered in well-settled and organised regions, and among many other occupations, where, because of the scarcity of gold, mining had to remain a minor industry. Hence men worked in the mines and gravel deposits between other regular work, but did not follow the business all the year round.¹ They could make more on their farms in the growing season than from the mines with their low grade ores; and, therefore, the camps were occupied only intermittently. At present, however, expensive mining and reduction plants which operate all the year round have been introduced at several mines.

Another intermittent type of camp occurs in some places in the arid south-west. Gold gravels occur in stream-beds where the flow of water is not continuous. A heavy downpour of rain may give the creeks a sudden, strong flow, which gradually dwindles to nothing, to be revived months later by the next heavy shower. During the dry season the men go up the ravines and get a large quantity of gravel out ready to sluice when the water comes. Then they return to the valley farms or ranches, and work at something else till the approach of rain. On its arrival all hands break for the sluices and wash gravel as long as the flow of water permits. Occasionally the signs of rain are good, and the men hurry to the gravel piles only to find that there is not enough rain to reach their diggings; or the storm comes in the night, and the water, having no one to control or use it, sweeps away the accumulations of months, and all is lost. Mining is the industry the men are there for, but owing to the special climatic and geographic conditions they cannot follow it continuously. These peculiar conditions of camp life and work are not common enough to effect the total output, but they illustrate one phase of geographic influence on the character of the camps.

Succession of Camp Occupancy.—In the normal order of things in the gold-mining States, the prospector has always been the first man on the ground. During the early days his voluntary services opened the way for the miner and the capitalist. He found and marked the deposit; miners began its development; capital came and bought as cheaply as possible; but the capitalist himself rarely searched for the deposits. In modern times the function of the prospector, with his peculiar training and development, is well recognised. Many of the large mining companies employ prospectors whose sole business is to scour the hills and ravines for more gold, silver, or copper. Of the several types of men developed under the special conditions, each finds place in the changing economy of gold and silver mining.²

Development of Permanent Camps.—In harmony with the permanence of form assumed by the industry, the permanence of camps increased. While all the work in a region was placer mining, the camp could not take on an enduring character; but, as the processes inevitably changed in many localities from the elementary operations of washing gravel to the more advanced, complicated, and expensive methods necessarily

¹ J. D. Whitney, *Metallic Wealth of the United States*, p. 118.

² H. H. Bancroft, *History of California*, 1884, vol. vii. p. 655.

employed in quartz mining, and in the extraction of values from even more complex ores of silver, very naturally more fixed camps and habitations sprang up around the more stable establishments. In some cases vigorous, substantial, well-organised towns have developed from these flimsy, temporary beginnings. Butte, Montana, a placer town of shabby miners' cabins in 1864, was given a copper smelter in 1866, and began its more extensive development in 1875. Five years later it had become a substantial town of 5000 people, and its population had doubled again by 1885.¹ In 1900 Butte contained over 30,000 people. Leadville, Colorado, with its predecessor Oro, furnishes another example. This now important mining centre rose in three years from nothing in 1877, through the placer stage to a town of 15,000 people in 1880, and that in a wilderness at an altitude of 10,000 feet. It all came in response to the impetus of silver and associated ores.² Cripple Creek, Colorado, and Deadwood, South Dakota, with a number of smaller purely mining towns possessing a permanent character, may be added to the list. Potosi, in Bolivia, sprang up from almost nothing, under the influence of the exceedingly rich silver mines of the mountain, to a city of 160,000 inhabitants, and this at an altitude greater than that of Mt. Blanc. The result was marvellous, and would have called forth comment even had it occurred under favourable circumstances, but under the actual conditions it scarcely seems in the realm of the possible.³

Virginia City, located on the Comstock lode, has been in character a permanent city from its foundation, because it was built in connection with the development of the great silver-gold mine below it. Many of the difficulties in the way of the development of the mines restrained city building. But a city must be had, because the mining required it. The town began very soon after the discovery of the lode in 1858, and, under the impetus of the great inrush of miners and others from California, grew very rapidly, so that in 1870 and 1880 it had a population of about 10,000. Its supplies had to come by wagon from California; its lumber for buildings over sandy wagon-roads for 20 miles; its water-supply was at first brought 12 to 15 miles in wagons, and later, at an enormous expense, from lakes in the mountains 20 miles away. No agricultural land near by contributed food, for all around was barren, parched, deserted wilderness. And yet the city rose in ten years to 10,000 people.

But when the mine ceased to produce, because the great obstacles encountered were then unconquerable, the city declined, and it is now but a shadow of its former short-lived greatness. The region, although once considerably improved, has reverted to wilderness. The close relation between the mining industry on the Comstock lode and the growth and decline of Virginia City and its associates, cannot be more clearly seen than in the accompanying Table.

¹ H. H. Bancroft, *History of Washington, Idaho, and Montana*, 1890, pp. 740, 752, 764.

² R. P. Porter, *The West from the Census of 1880, 1882*, p. 373. *United States Geological Survey*, Monograph XII., pp. 14 *et seq.*

³ J. D. Whitney, *Auriferous Gravels*, 1854, p. 171.

PRODUCTION OF COMSTOCK LODGE AND POPULATION OF THE THREE TOWNS
IN THE VICINITY—VIRGINIA, GOLD HILL, AND SILVER CITY.

Date.	Population (approximate). ¹	Production in oz. ²
1859	a few	30,000
1860	4,000	1,000,000
1870	13,000	3,000,000
1877	21,000	36,000,000
1880	15,500	5,000,000
1881	...	1,000,000
1890	9,000 ³	5,000,000
1900	3,000 ³	1,000,000

This city is only a giant of a common type. Towns were built hurriedly, badly, and extravagantly, as the mining industry grew, because everybody had full faith in the prosperity of the mine. After a more or less successful and extended boom, the mine in many cases began to decline, and with it the town. Abandoned claims, camps, and towns are to be found all through the Western mountains, and every year adds to the list.

Commercial and Outfitting Centres.—A class of places in very close contact with purely mining camps and towns contains a long list of distributing and outfitting towns all over the West, from Denver to the Pacific. Stockton on the San Joachin, and Sacramento on the Sacramento, both at the foot of the slopes leading eastward up to the mouths of the Sierra gulches and valleys, were two of the earliest of the class, and will serve to illustrate their characteristics. Each was within fairly easy reach of a number of mining camps, whose wants they supplied. Each had water communication with the sea and with that greater emporium, San Francisco. Each sprang up at a point where goods and people could no longer go in large masses, but must scatter to the individual camps. Merchandise and miners, transferred to river steamboats at San Francisco, were carried up the rivers to either of these places, and again transferred to heavy wagons or pack-animals, and then laboriously hauled out to the various camps.

Stockton was a canvas town in 1849, but also a commercial centre making very perceptible growth in the course of a week. Taylor⁴ predicted its success as a distributing point, because of its central position and means of transport. The mining camps demanded a centre somewhere in the vicinity, and this point had the requisite position. The enormously rapid increase in population and output of the tributary mines was closely followed by the expansion of the town. Shinn⁵ says it increased from a single ranch house to a canvas city of a thousand people in three months. For several years it was flooded with transients and with merchandise, because of its relation to the camps. People and

¹ Becker, Monog. III., U.S.G.S., p. 4.

² Lord, Monog. IV., U.S.G.S., p. 416.

³ Eleventh Census.

⁴ B. Taylor, *Eldorado*, 1857, pp. 98, 99.

⁵ C. H. Shinn, *Mining Camps*, 1885, p. 137.

goods destined for camps came here by boat faster than they could be despatched to the gulches. It never collapsed so completely as did others when the mining in its tributary gulches declined, because of its early-developed agricultural interests.

Sacramento also experienced a phenomenal evolution. In April 1849 there were four houses on the site; in November there were hundreds of tents, shanties, and respectable houses sheltering ten thousand people, most of whom were transients, some just arriving in California, others returning for the winter from their summer's digging. The town, apart from these diverse residences, consisted of a few stores and large platforms for handling freight, which were clustered along the river, while the unsightly collection of abodes was scattered along the flood plain for a mile.

Like Stockton, its business demanded that it should be close to the stream, and therefore, like its twin, Sacramento was frequently flooded by the sudden rise of the torrent-fed river. Its hasty construction, due to enormous and imperative demands for greater commercial and hostelry accommodation, and to the feverish excitement of its business men, resulted in many carelessly built, inflammable structures. Hence fierce and destructive fires ravaged the city. Fabulous prices prevailed. Carpenters struck because they were getting only \$12 a day. This price for labour, low compared with that in San Francisco, was due to the return of many disappointed miners who temporarily overstocked the market.¹ Single town lots were held at from one to three thousand dollars, when scarcely a house in town was actually worth that amount. As the time passed, buildings, expensive because of the great demand, the cost of labour, and the scarcity and expense of building materials, quickly replaced the tents and shanties. Prices were pushed too high, business became unsteady; the town surged with speculation, and became uproarious with traffic; profits reached 100 per cent. above rates accepted in San Francisco, and rents ruled as high as \$5000 dollars a month for moderate buildings, while lots crept to \$30,000 in the summer of 1850. In September 1850 this enormous inflation of values was followed by a terrific collapse. Similar crises, though less tense, arose again in this city and in other commercial centres. Floods, fires, and failures were the common city disasters. Sacramento, in a large fertile valley, did not experience the customary collapse on the waning of placer mining, because of the early utilisation of the agricultural possibilities, and because of its position as the State capital. It is to-day the capital, and a centre of considerable trade in agricultural supplies and products, which far outweighs its purely mining interests.

Other commercial centres of this class are Denver, Walla Walla, Lewiston, Fort Benton, El Paso, and even Salt Lake City. Denver is said to have sprung from a stage station to a city almost in a night, while a long line of mining towns rose along the eastern base of the Rockies.² Walla Walla was the outfitting station for the camps in the

¹ B. Taylor, *Eldorado*, 1857, pp. 220, 221.

² R. P. Porter, *The West from the Census of 1880*, 1882, p. 373.

rich Boise basin and Owyhee valley, and Lewiston supplied the Salmon and Clearwater valleys.¹ Fort Benton, at the head of navigation on the upper Missouri river, was destined to be a commercial centre as long as river traffic continued ; but its character as an outfitting and provisioning centre was determined by the discovery of gold in Fergus county, and especially in the mountains west of the fort. The place was but a fort and fur-trading station prior to the outbreak of Montana's gold fever, but by leaps and bounds it rose to the rank of a town, and even bade fair to be a city of note within a few years. The impetus of the mining industry was too great for the good of the growing town, for the arrival of the Northern Pacific railroad, required just at this time and place by the new industry, robbed the river of its traffic, and at the same stroke removed Fort Benton's excuse for existence. Hence it has declined, and Great Falls has risen as a manufacturing and smelting centre.² Seattle, in Washington, and Vancouver, British Columbia, bear the same relations to the Alaskan camps that the above towns bore to their respective regions.

San Francisco and the Influence of Gold.—San Francisco, one of the largest cities on the Pacific coast, is in its entirety a response to the influence of several classes of environmental elements. Founded in 1835 by an Englishman who built his own little group of houses, and augmented in the following year by the single structure of an American, the great commercial emporium began its existence. The Hudson Bay Company took advantage, in 1841, of its position, and established a branch house. Its growth up to January 1848, the date of Sutter's discoveries, amounted to about two hundred houses set along well laid out streets and squares, with a population of less than a thousand ; but in many respects it was one of the most thriving towns in California. Its people, chiefly Americans, were hardy, determined pioneers—backwoodsmen, artisans, seafarers, traders, and a few professional men. The town never was Mexican although under Mexican colours at the start, but there were a few scattered Spanish-Mexican mission settlements near.³

The locality was marked by Nature for a commercial centre, and, with the elements of commerce provided, promised to be a metropolis. It lay on the only natural harbour between San Diego and the mouth of the Columbia, and almost midway between them. It was in the gateway to a rich, fertile valley of enormous dimensions, bathed in salubrious air, a valley nearly closed to the east by mountain and desert barriers, and walled in on all sides by almost continuous ranges. Other harbours south of the Columbia had less of value in their hinterland. It of necessity had a monopoly of the trade of the State of California. Then its western outlook was toward the millions of the Orient just on the verge of their awakening. Naturally, a city would some day arise on this bay. Where would it be? The farther or inland side was too shallow for sea-going vessels, as were also the mouths of the rivers. The north side of the gate-

¹ H. H. Bancroft, *History of Washington, Idaho, and Montana*, 1890, pp. 406 *et seq.*

² H. M. Chittenden, *Early Steamboat Navigation on the Missouri River*, 1903, vol. i. p. 237.

³ H. H. Bancroft, *History of California*, 1884, vol. vi. pp. 6, 7.

way was steep and rocky ; the south was gently rising, and on the eastern side of the ridge, between the bay and the sea, there was a broad, low area stretching along the coast for some miles with depth of water before it sufficient for the merchant marine of those days. All this aided in determining the spot. Now, in 1848, all was like a great machine in place in the mill, but with no grist and no power. California's total American white population was about two thousand. No resources except furs, lumbering, and a very little agriculture were known, and these were undeveloped. The land was sparsely settled, unknown, and insufficiently watered for agriculture. Moreover, if development had depended upon the normal processes of migration and frontier evolution, against such heavy odds, it is hardly likely that fifty years would have accomplished what was done in five or six.¹

Suddenly and vehemently came the impulse which created excitement and chaos not only in the city but throughout the entire State and even thousands of miles beyond her undefined boundaries. Gold was found in gravels so marvellously productive and so easily worked, that anybody with a pick, shovel, and pan could gather from ten to a hundred dollars worth a day, and ran the chances of finding ten times as much in one hour. And San Francisco had a corner on all trade, passenger as well as freight, for all the developing industry of valley and mountain-side save that which crawled slowly across country in wagons.

Her first response was a rush of almost her entire population to the diggings across the valley, but in a very short time an incoming rush of immigrants replaced the loss. From less than 1000 in the spring of 1848, she grew to 15,000 in the early fall of 1849 ;² from a group of dwellings, stores, and little warehouses she became a great commercial city ; from a quiet fur-trading station to a centre of international trade and cosmopolitan enterprise and life. Every vessel in 1849 brought passengers, and the harbour was crowded with the shipping of almost every nationality. Goods and provisions were hurried to her wharves and into the streets. There were not half buildings enough to house the supply. Tents, and canvas or rubber-covered frames, piles of empty boxes, sheds, houses enclosed on three sides, and buildings in every stage of construction, and of every conceivable cheap pattern, might be found. From fifteen to thirty houses were built in a day. At least seventy-five were imported from Canton and were erected by Chinese labour. Streets stretched out up the hill to-day ; and to-morrow their flanks were cleared of chapparal, hemmed in by a double row of houses, and thronged with people and goods. New warehouses sprang up, and new piers were reaching farther and farther out into the thickening and enlarging forest of masts ; and the noise, motion, and bustle of business and labour were incessant.³ And all this in a place where lumber and even houses were imported ; where a year before there was not even a saw-mill ; where agriculture had no footing, and civil organisation scarcely existed ; where

¹ J. S. Nicholson, *Effects of Great Discoveries of the Precious Metals*, 1887, pp. 38, 39.

² B. Taylor, *Eldorado*, 1857, pp. 203-5.

³ *Ibid.*, pp. 109, 110.

both labour and materials were exorbitantly high; in fact, where almost everything but enterprise and gold-dust were lacking. All else was hurrying thitherward on the demand of these. Taylor estimates that the values expended for materials, labour, and lands would have built on the Atlantic coast a well-established and organised city of 100,000 people.¹

The constant stream of immigration brought every class from every land until one could see in the streets a throng as "diverse and bizarre as the houses" beside them—Yankees of every possible variety, and frontiersmen from all over the middle West, native Californians, Chilians, Sonorans, Kanakas, Chinese, Malays, and scores of others so browned and grizzled that their nationality was unrecognisable. Such a cosmopolitan population gathers in a commercial centre; but it was found here before the city became a commercial centre, and hence it must be ascribed to some other cause. Commerce came later when the market was ready. If the people themselves be consulted, they will answer that they were attracted by the stories of the gold discoveries.

Then the spirit or humour of the people was characteristic. The general excitement, good nature, and buoyancy have been remarked by all writers. There was a restless spirit, too, in those men, a bustling, energetic manner; energy to spare, a genius and an adaptability, rarely met with elsewhere. Men with little material to do with did what they could. Their buildings were a testimony to the use of makeshifts. Men were willing to put up with any convenience or inconvenience, for the sake of being there.

Prices and rents soared to fabulous heights. Taylor² tells of his garret-room beneath rafters, with home-made chairs and bed frame, which he shared with another man, and for which they paid \$25 each a week. They paid \$20 a week for board. A hotel—board structure, two or three stories high, and no conveniences—let for an aggregate of \$110,000 per annum. A canvas tent, 15 by 25 feet, used by gamblers, let for \$48,000 per annum. Shinn³ says the Parker House in San Francisco cost \$30,000 to construct, and let for \$15,000 a month. Labour cost \$10 to \$15 per diem, and some kinds even more. Trade in that evolving city was spasmodic. Merchandise, becoming scarce in the abnormally stimulated market, could command fancy prices; then the arriving of new stock would often over-reach the demand, and prices might decline far below cost. Of course, much of this irregularity in the supply and demand was due to the isolation of the place; for gold-mining was calling into being a city remote from all else, but near the miners. Telegraph, cables, and telephones did not connect the city with eastern markets, nor did rapid transportation bring new stock to a depleted market. A stock of merchandise exhausted in any line remained so, barring any chance arrival of the article wanted, until word could be carried to market and the goods returned—three months at a minimum.

¹ B. Taylor, *Eldorado*, pp. 203-5.

² *Ibid.*, 1857, pp. 54 *et seq.*

³ C. H. Shinn, *Mining Camps*, 1885, p. 138.

While San Francisco was so shut off from the outside world, she kept in close touch with her subordinates. With those sub-centres of commerce, supplied through the seaport, she was in frequent communication by wagon and pack-animal. Like other towns of the mining region, San Francisco's life and spirit pulsated with the life about her; and, while she may have more than kept pace with the country in material progress, she felt particularly the changes in trade currents as mining interest rose and fell in tributary districts.¹

And so the city grew. Her hasty and flimsy, but extravagant construction incorporated much bad planning, from which she suffered many things later. Severe conflagrations were so common that the sixth had occurred before the end of June 1851. Each time she built better and endeavoured to protect herself more adequately. Municipal affairs could not be organised fast enough to keep pace with the needs of the city; hence the chaotic and corrupt condition of administration and control may be ascribed to the influence of gold within her environment. The wave of flush times formed an incentive to disorders due to the incoming of idle workmen, and this in turn called for vigilance committees. Change was the order, both of officials and of form of organisation. Rivalry and abuse, supported by strategy, intrigue, and greed, succeeded in rolling up a city debt of over a million within the year ending February 1851.²

The first six years were a period of herculean achievement—hills were levelled, marshes filled, streets paved, the sites of smouldering ruins were covered with more substantial buildings, and order and system were gradually evolved from the most heterogeneous mixture of humanity and organisation ever collected in so few years. A commercial metropolis was formed, ranking well with the world's master commercial centres. And all was brought about against heavy odds. Unscrupulous officials, fires, lawless ruffians and vigilantes, debt, bad land titles, inflated land values, and emigration of thousands of men to more lucrative fields—these were her opponents, but she mastered them.

A crash in 1853, on the summit of the enormous inflations associated with the maximum gold production, shook the civil and social fabric as well as the financial structure, but only shook it together the better. It initiated many industries; miners entered farming of various kinds and helped to supply the city's needs. Manufacturing of candles and furniture, sugar refining and whisky distillation, founding and machine making, became notable industries in the city. She has grown and incorporated until a few years ago her population was over 350,000, and her rank was easily the first on this side of the Pacific. And had it not been for her location along a line of earth-crustal movement, no doubt she would have maintained her leadership. Her business, especially commercial and manufactural, is dependent to a considerable degree upon the mining industry even at present. Her commerce, in part, concerns itself with the handling of imported mining supplies, and her

¹ H. H. Bancroft, *History of California*, 1884, vol. vii. p. 682.

² *Ibid.*, vol. vi. pp. 164-220.

manufacturing with the making of many machines, materials, foods, and equipment for the mining industry.

While her present prosperity and national as well as international relations are due to her position and the products of the industries around her, it must be admitted that the development of these industries and the presence of the city in this generation are largely due to the stimulation of the gold-mining industry. Had no gold been found in the vicinity, there would have been little need as yet for such a mart.

Settlements and Towns remotely related.—Not all camps or settlements whose beginnings may be credited to the influence of gold and silver, were placed in the metal-producing localities; but, just as in other great migrations a few travellers turn aside from the trail to make permanent settlements, so here occasionally fertile mountain valleys and beautiful parks were settled long before the United States frontier in its normal agricultural development could have reached the position.¹ Some of these were occupied by families, *en route* for California, who became stranded, others by families whose enthusiasm had brought them thus far, but, becoming exhausted, permitted them to make permanent settlements and to begin farming, grazing, or lumbering, or all three, out in some charming but isolated locality. This halting sometimes led also to the discovery of new sources of wealth, minerals of various sorts, or interesting crop possibilities; but this always took place in advance of the general onward march of the agricultural frontier of the West.

So far as their relation to the precious metals is concerned, all other towns belong to one of two types. The first is that of Anaconda, Pueblo, and Tucson, with no mining at all. These towns were founded primarily for refining the ore, and many of their people work in great ore-smelters. Such towns are absolutely necessary to the progress of the mining business, because without places near the mines where the ore can be reduced, the industry cannot be carried on. These towns owe most of their development and present business to their relation to mining.

The other class consists of places, often founded before the discoveries of gold, whose business has come to be in some way tributary to mining, and hence stimulated by it. Such places are Astoria, Tacoma, Oakland, San Diego, Los Angeles, Santa Fé, Colorado Springs, and many others. It may be said that probably no city or town west of the 105th meridian is what it would have been without any gold or silver in the West. Most of them would as yet have had but little reason for being. Many of them were enormously stimulated indirectly by the immigration, commerce, agriculture, manufactures, and railroad development, themselves quickened by the presence and exploitation of gold and silver.

Metamorphosis of Towns.—An interesting change of character has taken place in the case of several of these mining camps and local commercial centres because of the influence of gold and silver. Benicia, at the mouth of the inner bay into which the Sacramento and San Joachin rivers flow, promised to be the commercial centre of that region; but in spite of her many advantages of position, San Francisco received the

¹ C. H. Shinn, *Mining Camps*, p. 134.

passenger traffic when the ships came in 1849-50, because the latter was nearer the sea and most of the vessels could not reach Benicia. San Francisco very soon outstripped her ambitious rival, who humbly retired to the rank of a quiet county seat. The gold excitement overruled Benicia's plans, made so quietly and securely. San Francisco, a child of circumstances, took the palm from the city of plan and design.

Placerville and Eldorado were purely mining towns. The former was famous under the name of "Hangtown," and sustained the first mob tribunal in 1849. It was very rich in 1848, and increased in 1849, but soon after began to sink because of the failure of the placers, and in 1856 it had passed from a rich flourishing town of brilliant promise, through abandonment, fire, and flood, to rise again more substantially built, and to grow gradually into a staid agricultural community and a dignified county seat. Eldorado passed through a similar history for the same reasons. The mining canals of both became irrigation ditches, and their wasted slopes were given over to viticulture, while the neighbouring fields passed under adequate tillage.

Many towns rose quickly from camp to trade centre under changing conditions, and as quickly melted to a rubbish-heap when the miners of the locality heard of richer finds elsewhere. Everything in the construction of towns partook of the precarious and unstable. A thousand incalculable incidents, usually styled luck, but growing out of the distribution of the precious metals, were constantly lifting up one town and pulling down another, inflating this district and impoverishing that. As the mining industry continues to increase, wood structures replace the tents, brick or better wood replaces the first wood, and the new-born city thrives; then the gold fails, and in a week the town of a thousand people is deserted, perhaps never to be again rehabilitated with activity, perhaps to lie dormant a season, and then, because new deposits are found, come forth as some other style of mining centre, or, because irrigation possibilities and soil resources have been recognised, as an agricultural settlement. Hence it is that wrecked towns as well as camps are exceedingly common in most of the leading mining States; and, further, it is true that similar conditions are producing similar results to-day. Millions invested in towns, ditches, and appliances, now in ruins, have been wasted because the actual distribution of the ore was not known, or because the proper processes for its extraction had not been found. No accurate estimate of this loss can be made.

Monterey, California, founded in the year 1770 as a Spanish mission and garrison, was the Spanish capital of the territory until 1847, and the American capital from then until after the constitutional convention of 1849. It was deserted for the mines in 1848, in spite of the dignity recently acquired, even as was San Francisco, and both commercial San Francisco and governmental Monterey were temporarily eclipsed.¹ Taylor² predicted a great future for the town, even though its governmental supremacy vanished with the removal of the capital to San José.

¹ H. H. Bancroft, *History of California*, 1884, vol. vi. pp. 63, 64.

² B. Taylor, *Eldorado*, 1857, pp. 140, 141.

But its early start availed nothing ; for it was effectively cut off from the influence of gold and silver by the Coast range, and no railroad has yet reached it through the mountains, although it has railroad connections and outlet both north and south between mountains and coast. In 1883 it had fourteen hundred people and in 1890 sixteen hundred. It is now no more than a little quiet residence town for a few retired men.

Influence on Place-names.—Names of towns all through the mining States bear the marks of their origin as mining camps. Instead of ville, city, burg, or ton, the affixes are camp, flat, bar, beach, bank, gulch, etc. Sometimes the name has the ordinary affix and a radical gold-determined, or it contains some term for gold or silver, or consists of something strongly smacking of camp-life. The following illustrations were selected from small-scale maps in a school atlas and in *Britannica*. It may be that one or two of these names were given for other reasons than the influence of the precious metals, but most of them are certainly gold-derived.

Angel's Camp	Goldburg	Silverton
Happy Camp	Gold Hill	Silver City
Camp Grant	Golden	Silver King
Chinese Camp	Gold Creek	Silver Bow
Moor's Flat	Richfield	Silver Plume
Dutch Flat	Ophir	Argenta
Fresno Flat	Eldorado	Chloride
Oak Bar	Oro Fino	Telluride
Rocky Bar	Oro Blanco	Eureka
Washington Gulch	Oroville	Powderville
Brown's Cañon	Placerville	Troublesome
Cut Bank	Quartz	Bonanza
Gold Beach	Enterprise	Presto
Goldendale	Silver	Fairplay

Scores of stations, cross-roads, and other minor places proclaim their ancestry in their patronymics. Not only do towns bear the royal colouring, but many words in our language have been coined for special mining terms, or incorporated into the language from some other tongue, or given special technical meanings, as results of the gold- and silver-mining industry. Pay-dirt, prospecting, hydraulicking, and pay-gravel illustrate the first type ; placer, bonanza, tye, and buddle the second ; and tom, ledge, show, colour, etc., the third.

Paper Towns.—City-building and town-booming by oily-tongued agents early became a business, and in the speculative atmosphere of the West the business grew. California suffered most in the earlier days because she was the pioneer as well as the greatest gold producer. Bancroft says this State had probably more paper towns than any equal area in the West.¹ The city-building craze possessed men most strongly in 1849 and 1850, after which the symptoms abated to sporadic cases with occasional epidemics, as in 1863. "Corner lot" speculations were

¹ H. H. Bancroft, *History of California*, 1884, vol. vi. p. 443.

common. Cross-roads, ferries, and even river-landings had their promoters who predicted their future greatness. Examples may be found in such paper fabrics as Linda, Kearney, Eliza, Featherton, and others from California's roll. Idaho has suffered much in recent years from town-lot agents, as well as from spurious mining companies and unscrupulous stockbrokers.

Influence on Settlement in General.—The discussion of towns and cities must not claim all our attention in the consideration of the settlement of the West, as influenced by the precious metals. The chief business prior to 1849 all through these Western States was trapping and fur-trading, a business whose success and permanence depended on the suppression of any tendency toward fixed settlements for the development of agriculture and grazing. Hence, the occupation of these States cannot be attributed to the influence of that industry. Following it, and discouraging it to a considerable extent, the mining industry spread over the whole western section, more actively and more permanently in some places than in others. Thus, mining the precious metals became the pioneer industry throughout much of the West. Because its tendency was to call into being, as associates and feeders, agriculture, grazing, lumbering, manufacturing, commerce, and government, this development of mining resulted in settlement for other subsequent industries. The history of settlement and the development of industries in most of the Western States is largely a history of their mining industry.¹

Colorado and California have had the most rapid development, and have been in the aggregate the heaviest producers. Nevada is the third in total output, but her backward condition is due to her lack of other possible resources. It is a marvel that even her mining industry has been able to reach such dimensions against such odds. What would her development have been had there been no gold- and silver-mining to nurse and coerce other industries? And of the other States, so far as settlement is concerned, probably Washington, Oregon, and Utah have been least affected; the two former, because of moderate values and limited development of the ores, while settlement for other industries has responded to the general call of progress and been stimulated by the influence of mining in neighbouring States; the latter, because religious beliefs suppressed mining for a long time but encouraged settlement for other occupations, and these were greatly aided by mining in other States.

In two ways the influence on settlement is evident. Tens of thousands of men went West to mine the precious metals, but many of them soon decided to withdraw, or were forced by hard luck, lack of capital, or ill-health, into other occupations. While a large number returned to the East, thousands remained on the agricultural or grazing lands or entered the forest as lumbermen, while still others entered shops, warehouses, stores, offices, etc., aiding the general settlement and development of the country by their presence and work. Further, the

¹ R. P. Porter, *The West from the Census of 1880, 1882*, p. 372.

great output of gold advertised the West both in the East and abroad. In connection with gold stories went its news of soils, crops, forest, and climate; and *bonâ fide* settlers, who never intended to mine at all, have gone into all parts of the West. Not only has gold- and silver-mining been a pioneer industry throughout the Western mountain States, but it has been a fundamental force in opening up to settlement as much of the vast area as it is desirable to settle.

Effects on the Foreign Population.—Little need be said of the special influence on the foreign population of the West. According to the Twelfth Census, foreigners are congested about Butte, Montana, in several places in California, both in the valley and on the mountain slopes, and in scattered patches over both agricultural and mining lands. It seems that with the Americans came also others in response to the drawing power of gold; but probably in no greater proportion than they came to engage in other occupations open in a new country. Certainly gold- and silver-mines have been no more effective in settling foreigners in their vicinity than have coal-mines, iron and cotton factories. Certain local phases and one general result of foreign settlement in the West must be noted. A large influx of Spanish-Mexicans occurred in the early California days, but it was always second to the pure American immigration even then. The Sonorans scattered all along the Sierra valleys, but were not allowed to remain because of their general indolent, unruly character, and their special tendency to thievishness. Their expulsion began well north, and they settled again farther south; then, again becoming a nuisance, they were sent home in great numbers. Mexicans certainly would have been more permanent settlers in California if the treasure had never been found, and no Americans brought thither to oppose them. A second local effect of the influence of gold on foreigners is the gift to the Pacific States, and notably to California, of thousands of Chinese. Many of these cheap labourers came exclusively to dig gold. Others came to engage in some of the lucrative subsidiary occupations, such as cooking, laundry work, and farming. Thousands are engaged in agriculture, horticulture, fishing, etc. They were not usually allowed in the mines or gravels with the Americans, so they took up abandoned claims, and even to the present thousands of Chinese are laying up money on the "worn-out" claims.¹ An attempt has been made to find out if there were any notable responses to California's call from gold- and silver-mining regions in other parts of the world, but without any result. Not one, but all occupations sent settlers to the mining regions.

The general effects over the entire area of the mining States, of their occupation upon an exceedingly mixed and varied population, drawn from all classes, creeds, and nationalities, are apparent. What Jordan² said of California as a consequence of this cosmopolitan character applies, though often with less force, to most of the mountain States. "It is the most cosmopolitan of all the States of the Union, and such it will

¹ H. H. Bancroft, *History of California*, 1884, vol. vii. p. 649.

² *Atlantic Monthly*, 1898.

remain. Whatever the fates may bring, the people will be tolerant, hopeful, and adequate, sure of themselves, masters of the present, fearless of the future." The percentage of the foreign element is no higher than in other portions of the United States, or in other industries, but the variety in any locality is greater, and no one element predominates.

THE INFLUENCE OF GOLD AND SILVER MINING UPON THE CHARACTERS OF MEN.

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The results of the influence of the precious metals upon the character of men are intangible, immaterial, and evasive. Many factors have entered into the character of our Western men and Western society beside the influence of gold and silver mining; and other factors than gold are able to produce some of the results which come in response to its influence. The oil craze is similar to the gold fever. Other kinds of mining than gold produce some of the same effects, and any frontier life develops some of the characteristics found in gold and silver miners. Hence, it has been extremely difficult and sometimes impossible to arrive at conclusions that are at all trustworthy. For these reasons, it will not be surprising if, on some points, the author and reader part company.

The Gold Fever.—The “rush” has been described as a consequence of an excitement popularly called the “gold fever.” This mania captured all classes of people, often making them oblivious of duty, forgetful of friends, and even of self and bodily comforts. The excitement in Georgia in 1829–1830 did not last long but was extraordinary. Professor Silliman² speaks of the excited state of men’s minds and of the speculative spirit existing: and adds that facts were rarely reported correctly; and the public mind, being morbidly excited, was blinded.

In California, the stories of gold did not seem to enthuse the people; but, when in April the dazzling yellow metal itself was

¹ This paper is a portion of a thesis presented as a part of the requirement for the Ph.D. degree in geography at Cornell. For other parts see *Bull. Am. Geog. Soc.*, Vol. XLII (1910), pp. 592–602; also Vol. XLIV, Feb., 1912; *Scottish Geog. Mag.*, 1910, pp. 449–466, and 1911, pp. 417 and 470; *Bull. Phil. Geog. Society*, Vol. IX (1911), pp. 1–22. Special thanks are due Professors R. S. Tarr, W. F. Willcox and H. Ries, of Cornell University, for criticism and suggestion throughout the whole work.

² *Am. Jour. Sci.*, XXXII (1836), p. 98.

brought into the streets of San Francisco, the fever spread, and the contagion swept through the State.³ Merchants and their clerks alike left the offices; lawyers, doctors, and even State officials went; soldiers and policemen deserted; whole ships' crews and officers abandoned their vessels when once within the harbor; farmers, ministers, laborers, and gamblers responded. The epidemic knew no social or class lines. During the first years, a kind of frenzy would seize a community; and thousands would rush away to some new and perhaps distant locality, where many would perish with disease or hunger, while the remainder returned in poverty and rags. They would leave localities of known value to search out a new one with no more provocation than a newspaper note.⁴

Gold was discovered in Coeur d'Alene placers of Northern Idaho in 1883 and produced the same enthusiasm; men surged in from New Mexico, Arizona, Colorado and California; from Minnesota, Puget Sound, Winnipeg, Assiniboine, British Columbia, and Dakota.⁵ When masses of gold aggregating 106 pounds were found near Bathurst, Australia, in 1851, and the news became public property, the greatest excitement prevailed. The *Sydney Morning Herald* of July 18, said "Bathurst is mad again. Men meet together, stare stupidly at each other and talk incoherent nonsense. The nerves of the community at large have received a severe shock." It has been the same in Alaska, Klondyke, Transvaal and West Australia, and from the beginning of gold mining down to the present. Gold in veins is much less effective than in gravel. Today, coöperation and the reduction of mining for the precious metals to an organized and capitalized business, remove the romance of gold mining, and of course cut off the excitement among the miners.⁶

It would be quite unfair to turn from the subject of gold fevers without mention of the effects on those left at home. The enormous migrations of 1849 and subsequent years tore many families asunder, leaving sad mothers, sorrowing wives, and neglected children with poverty and disappointment to combat; while he who had gone forth

³ Bancroft, H. H., "History of California" (1884), Vol. VI, p. 58.

⁴ Bancroft, H. H., "Hist. of Mexico," Vol. IV, p. 702.

⁵ Shinn, C. H., "Mining Camps; a Study in American Frontier Government" (1885), p. 255.

⁶ *World Today*, Vol. VIII (1905), pp. 178-185.

sometimes struggled with fortune successfully, but frequently sunk discouraged and diseased into an unmarked grave.⁷

Effects on Health.—While many left at home suffered from privation, the miner in the field and camp, contended with disease and very often gave up health, or even life itself, in his eager search. Literally thousands were stricken down while en route in the desert and mountain wastes, thus depriving families of their support and society of some of its strength. This was because of the distant occurrence of the gold and lack of proper food, water or shelter. The exposure to weather and to cold and ague by standing in cold water at work; the privations due to lack of food and shelter, and the irregularities induced by improper food, begot a whole crop of maladies, ague and chills, fever, dysentery, scurvy, pneumonia, malaria. Most of these are common in new countries, but exposure and vicious mining methods so weakened constitutions that these disorders were doubly potent. Drinking water from some of the streams gave diarrhea to 99 per cent of the men.⁸ Beside exposure, the mental strain of business life told on minds, as the insane asylums of the early years will bear abundant evidence.⁹

Character of the Miner.—Certain virtues and vices seem to have been begotten or nourished by the conditions in gold mining camps, or by the influence emanating from them. Self reliance developed (*a*) because anyone could succeed without a superior, and no one could afford to hire help; (*b*) because one had no time to help another so long as the latter could help himself. Balancing this independence, a fraternal spirit appeared, especially in the beginnings in the several fields; partly because of the isolation from home and the East; partly because of dependence for society and for sympathy upon neighbors. This spirit brought together men differing greatly in birth, education, and tastes, and welded them into something of a guild, a kind of free-masonry.¹⁰

Friendships and personal attachments sprang up between men of very different temperament and culture, because the conditions required that they work together, and gave them a community of

⁷ Bancroft, H. H., "Hist. of Calif.," Vol. VI, pp. 118-119.

⁸ Taylor, B., "Eldorado" (1857), pp. 206-7, 262-3.

⁹ Royce, Josiah, "California," Am. Commonwealth Series, pp. 392-3.

¹⁰ Shinn, C. H., "Mining Camps," pp. 133-290; Barry, T. A., and Patten, B. A., "San Francisco in the Spring of 1850" (1873), p. 8.

interest and risk. Men who crossed the land or the sea in company and worked in a gulch together held reunions along the Pacific Coast for many years. There was a cordiality peculiar to the conditions, a jovial fellowship which developed at the expense of ordinary forms of courtesy.¹¹

Gambling, drunkenness and improvidence were the greatest vices of the miners. Placer mining itself was, and is yet, a very good game of chance. It gave all the excitement of the game with the charm of the wilderness, and often added the novelty of a solitary independent game.¹² It brought familiarity with chance and created a desire to tempt luck. In the placer stages, gambling was mainly by means of games during the evening. It became very intense. The gold had come easily, and there was plenty more where it came from. Isolation from home and relatives weakened restraint; evenings were dull, and amusements lacking; therefore almost everyone played. When the veins began to be worked, the mining stocks and corporations appeared, speculation in part replaced the gaming table. Clerks and laborers as well as merchants and other business and mining men whose daily occupations were, at best, dangerously near gambling, and whose nerves were constantly tormented by unnatural yet, for the time, inevitable excitement and strain, entered into the sport fully as fast as their means warranted. Wildest speculation occurred, and individual as well as social disaster followed, even to the confusion of bankers and conservative Easterners.¹³ Gambling and speculation were not peculiar to the gold and silver mining industry; but they found therein fertile soil, because of the easy money at hand, the general excitement, the distance from relatives, lack of restraint, the hustle and self-absorption, and the intense desire to get rich. Cope¹⁴ calls attention to the waning of the spirit of speculation throughout the West because of the great changes since 1849 in the mining business. The large concern, with its capital invested in a fixed and elaborate plant, its ores of all grades, and its many mines consolidated under one immense organization, has much less to run chances upon. At present, mining and

¹¹ Taylor, B., "Eldorado," pp. 310 f.

¹² Patterson, R. H., "The New Golden Age" (1882), Vol. I, p. 253.

¹³ Royce, Josiah, "California," pp. 391-3.

¹⁴ *World Today*, Vol. VIII, 1905, p. 181.

extraction partake largely of the nature of a manufacturing enterprise.

Although drinking and drunkenness are very common, it is doubtful if they are more so than in other kinds of mining, or even in old settled and established communities. The predominance of men, the excitement and freedom, the abundance of wealth, and the social good feeling, which have been characteristics of gold mining districts all through the West since 1849, tend to foster this evil. The lack of restraint and the failure of the civil, social and religious organization to keep pace with the rapid development under the stimulus of the precious metals, make for lawlessness and liberty-taking, so that indirectly gold and silver share the responsibility. But a counter quality was developed in the mining districts. Great popular interest in civic order was taken by the mining and other population, because no superior organization dispensed that article; and order and security of property were much better than would be expected, considering the sources and heterogeneity of the people and the conditions under which they were living.¹⁵

Extravagance and its offspring, improvidence, were as natural fruits as the conditions ever produced. First, almost nothing could be had for ordinary prices; and, since one must pay exorbitantly, he felt that he might as well purchase anything that his pile could compass. Second, those who had gold, had come by it easily and expected to get much more before going home. Third, there was the novelty of paying ten prices for an article instead of one, coupled with the ease with which it could be accomplished. Men did not realize in those flush times and strange surroundings, the real cost of things. A few, unused to labor, whose daily ounce or two seemed a poor recompense for weary limb, sore muscles and flagging spirits, carefully hoarded their gains; but those whose lives had been mostly of work and privation (by far the larger per cent. of the miners) were open-handed. Impulse and whim had free rein. Men accustomed to no luxuries beyond a good beef steak and a glass of whiskey, now dined on tongue and lobster and drank ten dollar champagne. Oregonians were said to surpass all others in dietary extravagance.¹⁶ Yet there were men of culture in many lines who

¹⁵ Taylor, B., *loc. cit.*, pp. 101, 310-14; Shinn, C. H., *loc. cit.*, p. 287.

¹⁶ Taylor, B., *loc. cit.*, pp. 254-7; Shinn, C. H., *loc. cit.*, p. 139.

were careful, provident and regular, unscathed by the violent temptations to recklessness.

The influence of gold when taken from the natives or mined by oppressive slavery in Mexico and South America, seems to have had quite an opposite effect. There, avarice and greed developed enormously; but in the United States, where every man was his own miner, and had to lift the treasure by his own strength or skill, these qualities seem not to have taken root.

In any study of the personal character of the miners of the West, it is necessary to take into account the liberal variety of men upon whom the influence of the precious metals, with other factors, had to work. The miner came from the North, the South, the East and West, from Europe, Asia and Latin America, from home and from prison, from farm and town, shop and ship; he was raw or cultured, ignorant or educated, boisterous or gentle, stupid or alert, red, blonde or brunette. All types were cast together with their multitudinous personal differences. Some of these initial qualities were lost, some were transformed, developed or dwarfed, and new or dormant qualities were brought out. Some of the changes were due to change of environment; some due to the frontier nature of the region; some directly due to the influence of gold and silver, and some indirectly traceable thereto. And from it all, there developed a species—the typical Western miner; a variety—the prospector; and in general, a social character, and a basis for the present tone and character of the citizen and of society in our mountainous Western States.

Following a well-recognized law—man is the product of his own environment into the condensed and crystallized effects of all environments previously occupied by himself and his race—one would not expect all who have had contact with the production of the precious metals to be alike, but he might feel confident that they would have certain common well-marked characteristics—a common factor. After reading many character sketches, descriptions of camp and western life, and estimates of men and society in the West, the following summary has been made,¹⁷ embracing some of the personal characteristics of miners.

¹⁷ Besides books mentioned in other references in this paper Bret Hartes' stories and poems of western life were examined; also works of Joachin Miller, Josiah Royce, and J. D. Whitney and others.

1. Hardy; because selected and hardened in a severe life, out of doors, subject to weather and privation.

2. Generous; because right at hand were the means, also the opportunity to share, and many chances that he too would soon need another's aid.

3. Careless and reckless; because of the chances constantly run for success or failure, because of association with other gold-cultivated reckless characters, because of the distance from home and lack of family ties, and because of general excitement.

4. Happy and hopeful; because of excitement, many chances of success, constantly hearing of others' good fortune, and necessity of outdoor life.

5. Brave, because only the stronger spirits started, and these were sorted again en route and yet again continuously in the gulches; because of isolation and vicious associates with no defence save his own.

6. Self reliant; because of ease of success without aid. No one had time to seek or give counsel or assistance unless needed.

7. Exuberant with life and push; because mostly men, young and selected, successful, hopeful, and in new untried conditions.

8. Resourceful; because driven to it by circumstances. Devices must be made, and experiments conducted to find best adapted machines and methods.

9. Orderly, and loyal to order; because under the conditions he could have no order unless he helped to make it; and it must be had, if at all possible. He demanded fair play; honest himself, and exacting justice and honesty in others.

10. Impetuous and hasty; manifested in duels, trials and executions, and in snappy decisions on courses of action. In the former cases, a delay meant an escaped offender. There were no prisons and no time to stand guard. In the latter case quick decisions brought best results.

11. Aptitude and adaptability; power to adjust and to grasp opportunities. This quality was specially nurtured in the mining camps because of their evanescent nature and the constantly changing conditions and associations. It developed in individuals by virtue of a natural selection process. He who adjusted himself to new conditions had a much better chance of success.

Rarely do wholly new traits of character seem to have developed,

but abnormal growths of certain qualities and dwarfing of others, thus producing an unsymmetrical character are common.¹⁸ Elements of character most unlooked for would spring up in a man and come to fruition, before his acquaintances or friends were aware even of their existence. Men would indulge in dangerous or frivolous excesses, when they had formerly been temperate. They would be greatly given to drink, generosity, talkativeness, and jesting. Taylor considers these excrescences, "rank wild shoots slightly weakening the trunk, but signs of the abundant life."

The Speculator.—One or two special types of character and occupation deserve special mention at this point. When stocks and companies came into vogue, and men cared more for speculation in stocks and properties than in gambling machines; the speculator evolved from the proprietor of the gaming table, or he developed from a miner who saw riches in the enthusiasm of his fellows. He is a product of the printing press and the credulous gold seeker. His whole business in this connection has to do with gold mines, real or fictitious, and with a quality in men called forth or developed under the influence of gold. He booms a mine, sells properties or company shares, and pockets the proceeds, leaving beautifully engraved certificates in the hands of his purchasers. He is the eloquent advertiser of modern times; one who induces others to speculate in gold mines, which have little value outside their Broadway offices and embossed certificates.¹⁹

The Prospector.—The prospector is undoubtedly the most typical human product of the whole gold and silver mining business. Men rarely began mining with the expectation of becoming professionals, but many of the more adventurous found themselves, at the end of a year or two, well within the meshes of the web, and then, unconsciously perhaps, surrendered themselves to the lot of a prospector.²⁰

Equipped with shovel and pan, blanket, skillet, matches, a gun and a knife or two, far too careless of food and personal comfort, utterly oblivious to vicissitudes of the elements, beyond the ken of man for months, roved the adventurous, restless, professional prospector, dreaming at night of nuggets and heaps of gold, and

¹⁸ Taylor, B., *loc. cit.*, pp. 254-57, 310 f.

¹⁹ *World Today*, Vol. VIII (1905), p. 179.

²⁰ Patterson, R. H., *loc. cit.*, Vol. I, pp. 239, 253-4.

burning all day with a thirst for gold which gold only quickened and never quenched. He lived on wild game, berries and anything procurable, paid little attention to health, sought solitude and seclusion, was worth his thousands one day and nothing the next, usually a keen observer, grizzled, poorly clad, brave, hardy and careless.

The prospector was the advance guard of the miner. He wandered away from the camp, up ravines and over divides, picked at the gravel here and there, washing a bit in his shovel or pan, then peering in for "color," the measure of his success. Thus he passed the snowy mountains, and crossed the burning plains, becoming nomadic, moving on unverified report, and circulating news of his various finds. Unless the prowling Indian, dysentery or starvation accomplished the deed too soon, old age crept in and took him unawares, and his wasted body or bleached bones were left to mark some lonely gulch or sentry hill. His hoarded dust in leathern bag sometimes revealed his business, when regathered by another solitary prospector who happened by the deserted wealth.²¹

His type is a minor element in the exploitation and development of the West today. He works alone, unguided and, in the main, unfollowed, unless in the employ of some great concern where both he and the mining expert contribute to the expansion of the enterprise.²²

Effects on Western Business and Social Life.—Many personal qualities of the miners discussed above were so common as to be more or less crystallized in society, and others still more universal aided in giving the characteristic tone to western society. Royce points out that in the early days there was in California a blindness to social duties and an indifference to the rights of certain foreigners.²³ This latter was noticeable concerning the Mexican "greaser" and the Chinaman. The all-absorbing personal ambition to acquire gold, and the carelessness, overhastiness and extravagant confidence in luck, which seems to be largely gold-born, were certainly in great measure accountable for this early lack of the normally very prominent pioneer characteristics, thrift, sociability, promotion of the

²¹ Patterson, R. H., *loc. cit.*, Vol. I, p. 245; Bancroft, H. H., "Hist. of Calif.," Vol. VI, pp. 385, 390, 391.

²² *World Today*, Vol. VIII (1905), p. 181.

²³ Royce, Josiah, "California," p. 2.

social organization, and affiliation with everyone in the community, even though his nationality, or skin, be of different kind.

Later, men becoming aware of social obligations took up with the usual zest and energy the task of building a well-organized, permanent and progressive society and State. In many parts of the West, the first few years witnessed the conditions noted in California, and later years have seen a similar change.

Peculiar business methods grew up and flourished in California during the first few years of her Golden Age. Extraordinary abundance of metal made it possible to pay all debts punctually, and a public spirit unfolded which was opposed to slackness.²⁴ Men were forced to have business confidence in each other. Business was transacted on a large scale, and the market was so absolutely sure that the ordinary solicitation and attempt to reduce the price were almost entirely forgotten. The merchant became indifferent as to whether the customer purchased or not; he was sure of a speedy sale anyway. And the customer bought if he approved the price, or really wanted the goods; if not, he went away. Usually he paid the price without a word. So flush were the coffers that men loaned money without security and many times without even a note, suffering little or no loss.

These general conditions continued for ten years, until business began to settle into more secure routine. Then those who continued to display the same indifference to purchasers or to loan without note and security were forced to the wall. Competition rose; the transient regime entirely disappeared; and with its removal many a business man, failing to adjust with sufficient alacrity to the new conditions, went into bankruptcy. Much of the same results were found in Australia during the period of great abundance, and were followed by similar subsequent change.

Beside these abnormalities in trade, many writers mention an exuberance in everything, which manifested itself not a little in business and enterprise. Men were possessed of a spirit of hustle, due, in part at least, to success and to the bountiful resources and ample opportunity.²⁵ Caution and prudence seem to have been thrown to the wind, and yet men prospered. This spirit was propagated

²⁴ Taylor, B., "Eldorado," pp. 59-60.

²⁵ Bancroft, H. H., "Hist. Calif.," Vol. VI, p. 225; Taylor, B., "Eldorado," pp. 310-314.

wherever the new gold went, and there resulted a quickening of enterprise, an intensifying of prosperity, an augmented productivity until Hume²⁶ remarks "In every kingdom into which money begins to flow in greater abundance than formerly, everything takes on a new face. Labor and industry gain life, the merchant becomes more enterprising, the manufacturer more diligent and skilful, and even the farmer follows his plough with greater alacrity and attention."²⁷ Increased gold and silver production seems to be not only a local stimulant but a universal industrial tonic, vivifying enterprise as far as it goes.

A characteristic quality of Western society has been its lack of rank, its democratic equalization. Taylor predicts that California will be the most democratic country in the world. This democracy was due to a number of conditions. (1) The richest never came to California nor to the other mining regions, and the poorer could not come, so the financially determined social range from the start was less than in the East. (2) Those who came all worked, worked side by side, and at the same or similar occupations. (3) None could afford to hire or be hired. (4) Where riches lay so near the surface, they conferred little advantage.

In the course of time, as mining methods have changed, financially determined social rank has arisen. There are laborers and capitalists in two well-established classes. This distinction could not well have come in an agricultural pioneer community. It is little known in new countries other than those mining gold. In the East, property plays a part in social organization, but position, scholarship and culture are stronger factors. It is no wonder, however, that in the West and especially in California, many of the citizens know no aristocracy save that based on wealth, and that by many the clergyman or professor is not to be considered eligible to the best society unless backed by his gold. Oregon and Washington, less important as mining States, seem to feel this distinction less.

Gold and silver mining brings men closer together physically and thus creates links of town-life and society.²⁸ In spite of the strong

²⁶ Hume, D., "Political Discoveries," 2d edition, p. 47.

²⁷ Stirling, P. J., "Gold Discoveries and Their Probable Consequences" (1853), pp. 256-7.

²⁸ Shinn, C. H., *loc. cit.*, p. 227.

individualistic spirit in mining communities, there is a real charity and a healthy fraternalism not known or possible in other kinds of frontier life.

The Camp as an Organizing Force.—As an organizing force, mining-camp society is one of the strongest and quickest to act. This has been shown in the case of court organization, and was specially marked in the massing of men in orderly concourse to discuss and carry into effect district organization. Popular discussion was a right of miners, growing as naturally out of their environment as did equal mining rights; and assembling with startling energy and swiftness for effective consolidation was as much to be expected as hasty trial and execution. The miner saw the need of order, because he was removed from its protection; and, under the tremendous pressure of local demand for unification of all forces, he became bound to his fellows by common interests into a social compact owing allegiance to no higher authority. The evolution of social community when begun was much more rapid under the influence of gold than it could have been among a more staid and less mobile populace.²⁹

In discussing the characteristics of men in mining regions, Shinn, writing in 1884, remarks that they are a class peculiarly ready to assemble for free discussion, to have debates, to start arguments and to listen to stump speeches.³⁰ The early training of miners' courts and of camp life have left their impress upon the people of the mining regions. Compared with the people of the valley engaged in other occupations, they bear relations similar to those born by Tennessee mountaineers to the valley dwellers of the same vicinity. But these mining mountaineers compared with the ordinary mountain dweller, have a closer organization, a more constant habit of seeking each other's counsel, of meeting in assembly, and of openly discussing local and general affairs.

Spread of Camp Spirit.—The mining camp spreads its influence with the wanderings of prospector and miner. It was as much a unit and centralizing force in the West as the town in New England, and the plantation in the South, and fully as much a product of the environment. Institutionally, it underlies the Western commonwealth; intellectually and socially, it represents a colonial era; but

²⁹ Shinn, C. H., *loc. cit.*, p. 135; Taylor, B., *loc. cit.*, pp. 310-14.

³⁰ Shinn, C. H., *loc. cit.*, pp. 226-7.

in both respects, it is a type not found in merely agricultural or pastoral development, but belongs to the production of the precious metals. Not only has the camp and mining district life given its strength, energy and manners to western society, but it has already passed as a powerful force into the very fiber of the social fabric throughout the western mining States. Men and women trained in that atmosphere are in control of the departments of state and local government, are leaders in society, and while the whole organization of state and society is similar to that in the East, its movements are quicker, its pulse healthier, and its jurisprudence more primitive, its spirit of unity stronger and tone more democratic.

Oregon has the name both at home and among its neighbors of being the least progressive of all the coast states, although it was one of the earliest occupied, having its permanent settlements before the California gold discoveries. May this not be in large measure due to its lack of gold and silver mining and of contact with mining life? A comparison of Seattle, Portland and San Francisco is also striking. We have seen the character of the latter. Seattle is said by travellers to resemble Chicago in its hustle and push. Portland is much less active. It is an agricultural market but has little contact with gold mining, while Seattle has, besides agricultural and lumber marketing, an extensive business in outfitting Alaskan and Klondyke miners.

Effects on Other Institutions.—In the beginnings of the development of the various districts, certain institutions were slow of growth because neglected for the Western *summum bonum*—gold. Perhaps the slowest was the church and with it religious life. All writers pay a tribute to the miners when they speak of their reverence for religion, their emotions and responses in cases of births and natural deaths. Probably much of this feeling toward spiritual things was due to the scarcity of church and religious influence, which in turn was a product of the conditions. Certain institutions must reach a community last, and these will be determined by the relative importance attached to them by the members of each community. Naturally, where the material interests were so clamorous for attention, their importance was magnified to the detriment of the spiritual.

It is also common testimony that the Westerner today has a very high regard for and interest in the church, religion and education.

Probably this is a development of the earlier feelings, coupled with an increased desire to have for his youth what the exigencies of the times forbade him to enjoy.

On Literature.—Books, articles and stories in considerable numbers have sprung from the Western conditions, but as yet there is little that can take rank as literature. A swarm of little, cheap, and often loud books by persons who had spent “three weeks” to “six months” in the gulches came up as spontaneously as mushrooms after a June shower.

The scientific literature is no small item. Thousands of pages along many lines, geologic, petrographic, chemical, mining and engineering have been published in books and journals. Many volumes of more or less technical reports annually appear. Much of the western fiction is gold inspired. In the gulches was found not only the pioneer conditions attractive to all readers but also a romantic, novel background set with gold nuggets, pious gamblers, forgotten forty-niners, tricky Mexicans, Indian outlaws and rescued innocents, all possible and all thrilling. A thousand stories such as those by Bret Harte illustrate the spirit of the times. Cincinnatus H. Miller (Joaquin Miller) in his poems has depicted the mountain scenery, open-air life, and freedom, often lawless, of mining days; and other lesser men have written, yet the total is but meager.

The great mining West has a treasure house brimful in her romance and history; an inspiration in her scenery for the outdoor poet; a theme for the dramatist in the vivid life scenes of the overland routes, her mining camps and forests; a sublime symphony for the deft fingers of the artist to express in music of poetry, song, or story:

The masters of these themes will be products of the environment. They will grow up in the grandeur and vastness of those majestic mountains and profound valleys, opened to the world by the far-reaching influence of the metallic treasure in their hearts and mantles. Men of spirit and strength have already written, but the best from this virile, exuberant and cosmopolitan people, in a new and varied country, is yet to come.

The Commingling of Races.—As already shown, under the influence of gold and silver there were drawn to the West and especially to California, all nationalities and conditions of society. The mass of population was most heterogeneous and unpropitious, yet there

"is growing up" says Taylor, "harmony beyond the most sanguine hopes."³¹ This resultant, save some very local foreign examples, the most cosmopolitan of all societies, was not alone due to the variety of its ingredients. Commingling races and interbedding social strata, coupled with primitive and similar modes of life for all; the most perfect mixing process carried on by means of characteristic rushes; the common risk and responsibility, have all collaborated to produce the finished product—Western cosmopolitan society. Much of the virility and enterprise in California is a consequence of the complexity of population and its complete mixing. And by the same means, the citizens, facing the awakening Orient, were prepared to enter broad world relations.

World-wide Results.—There were broader social effects, responses to the influence of gold and silver in the Far West. The gold seeker's emigration from all the world was socially a disturbing influence touching the spirit of the times in many lands. The discoveries and exploitation of treasure called forth hordes from quiet, steady civilizations, relieving congestion, quickening markets and reviving life, thought and action. There was a loss from many lands and communities of capital and strong arms, to a new, wild, and untried country.

Society in the aggregate suffered by loss of moral restraint incident on mining life, and the consequent vice, crime and bloodshed, gambling and thriftlessness, and the partial loss of mental equilibrium. And so the subtle influence of a very potent element goes on permeating, enthusing, restraining, inducing, discouraging and cheering, and all the time preparing the way for speedy emergence of the Great West in its strength and integrity.

³¹ Taylor, B., "Eldorado," pp. 101 f.

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THE PRECIOUS METALS AS A GEOGRAPHIC FACTOR IN THE DEVELOPMENT OF THE UNITED STATES*

A Summary by GEORGE D. HUBBARD,
Oberlin College, Oberlin, Ohio

IN the preparation of this dissertation, the purpose has been to set forth the evidence and the extent of the geographic influence of the precious metals in the development of the United States. If undue emphasis has seemingly been given to the geographic influences, it may be simply because all other classes of influences and their effects have been disregarded for the time. This lack of attention to economic, social and other forces has not been through a lack of appreciation of their importance or a desire to detract from their interest, but because of the purpose to make clear and to emphasize the influence of gold and silver growing out of their geographic distribution and geographic associations and relations.

Care has been taken to pursue the investigation along each line as far as the evidence will allow; and caution has been used to prevent drawing unwarranted conclusions. The facts that various other causes produce similar results, and that several causes operate together to bring about a single result have often complicated the problem. After certain results have been noted, an examination of other classes of influence—economic, social, religious, historic, and racial—has been made to determine which cause has been effective, or which should be considered more important. Occasionally, in testing the power of the influence of any set of conditions, or the degree of the responses to them, it has been found helpful to suppose changed conditions, and note results. This device cannot be considered final, because one is never sure what would happen under hypothetical conditions; nor can he be certain that he has taken cognizance of all conditions.

*Under this general title there have appeared a series of articles dealing with several phases of the question. Together they constitute the thesis presented by the author to Cornell University for the degree of Doctor of Philosophy. The papers may be found as follows:

Scott. Geog. Mag. Vol. XXVI (1910) pp. 449-466.

Bull. Amer. Geog. Soc. Vol. XLII (1910) pp. 594-602.

Scott. Geog. Mag. Vol. XXVII (1911) pp. 417-26, 470-74.

Bull. Phil. Geog. Soc. Vol. IX (1911) pp. 1-22.

Bull. Phil. Geog. Soc. Vol. X (1912) pp. 36-50.

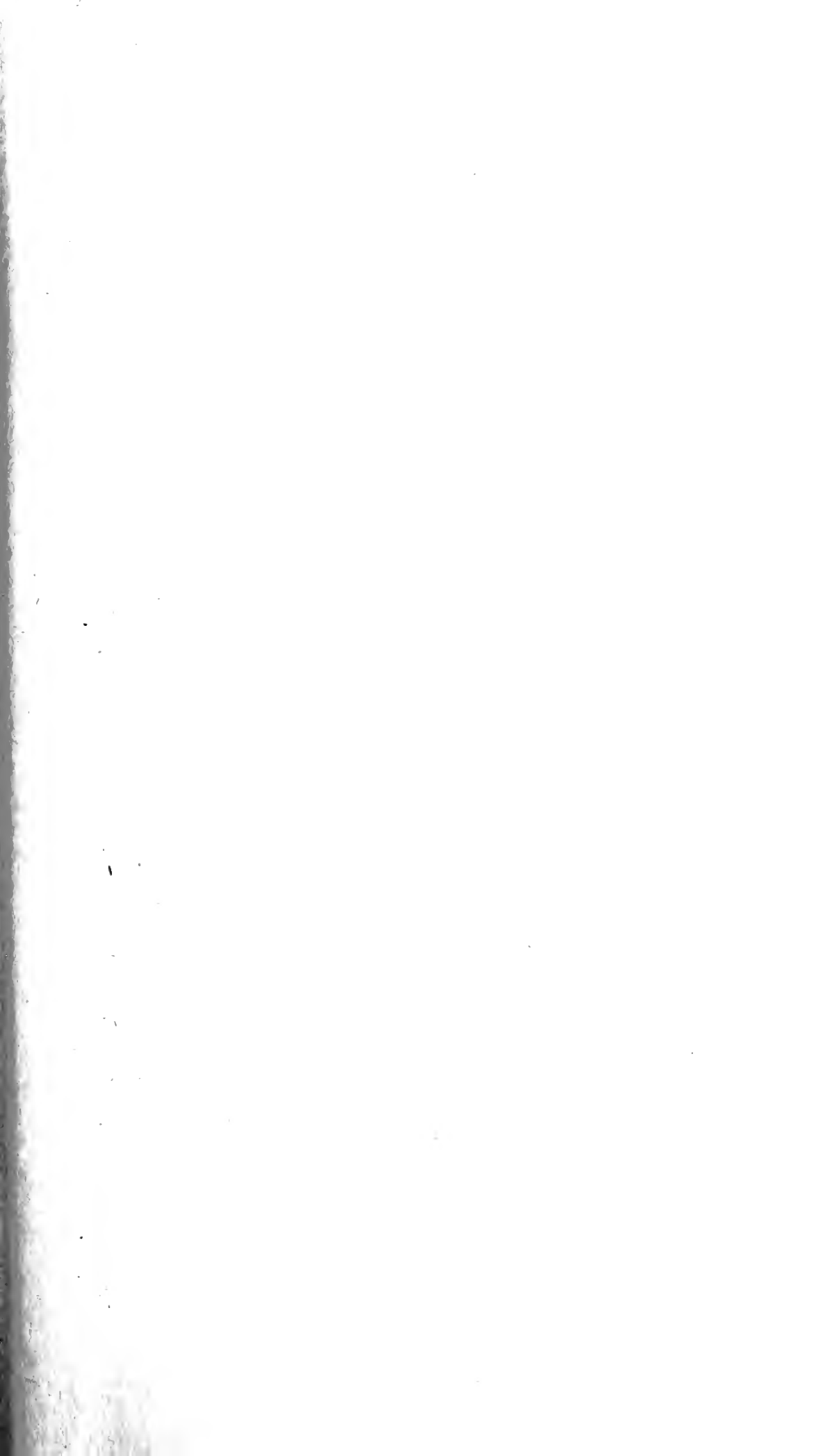
Bull. Amer. Geog. Soc. Vol. XLIV (1912) pp. 97-112.

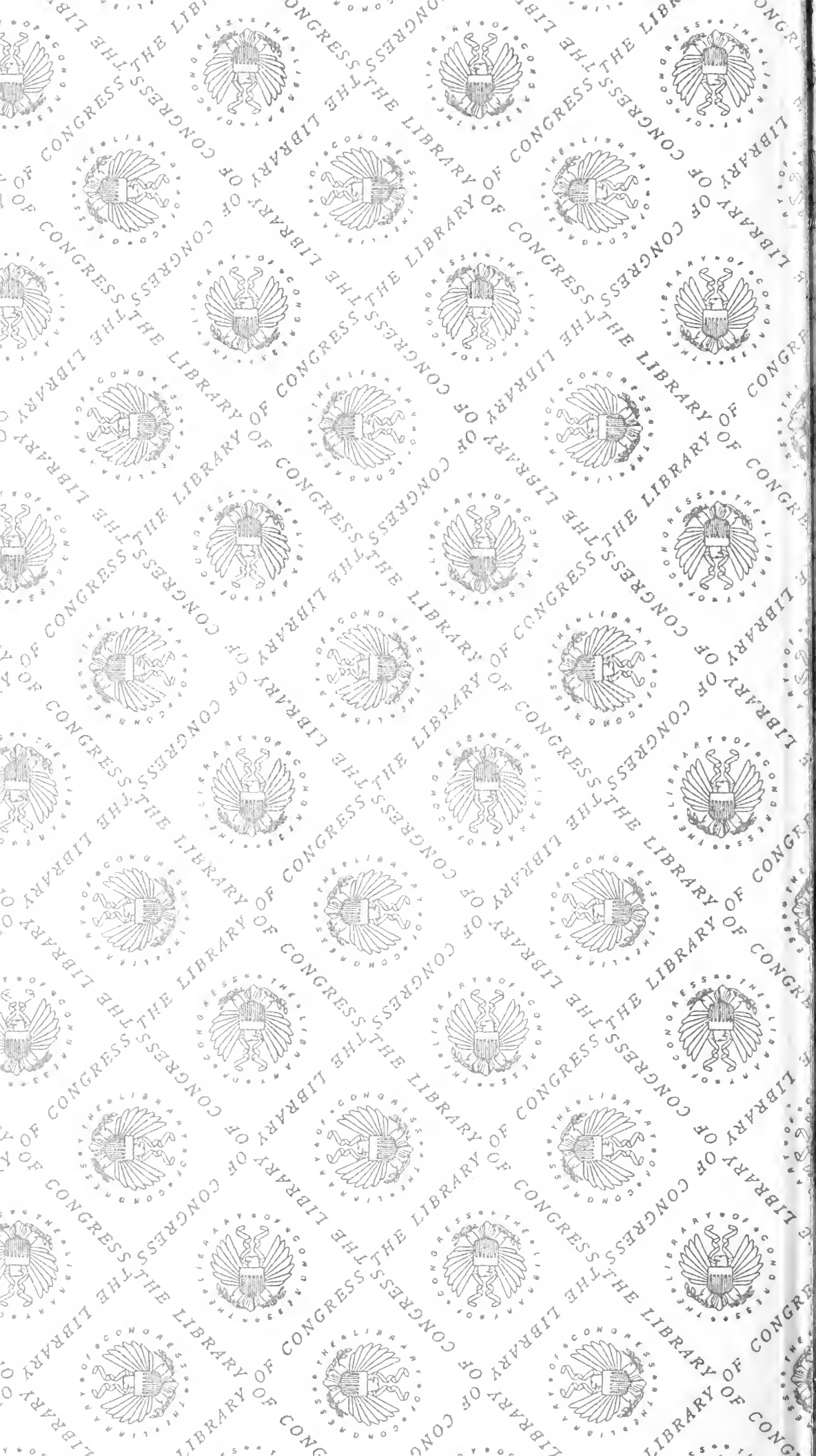
in the distributing and quickening influences of the miner's emigration, in the loss to society of strength and restraint incident on mining life, and in the enlargement of knowledge and extension of vision felt in every nation of the earth permeated by the subtle influence of the precious metals.

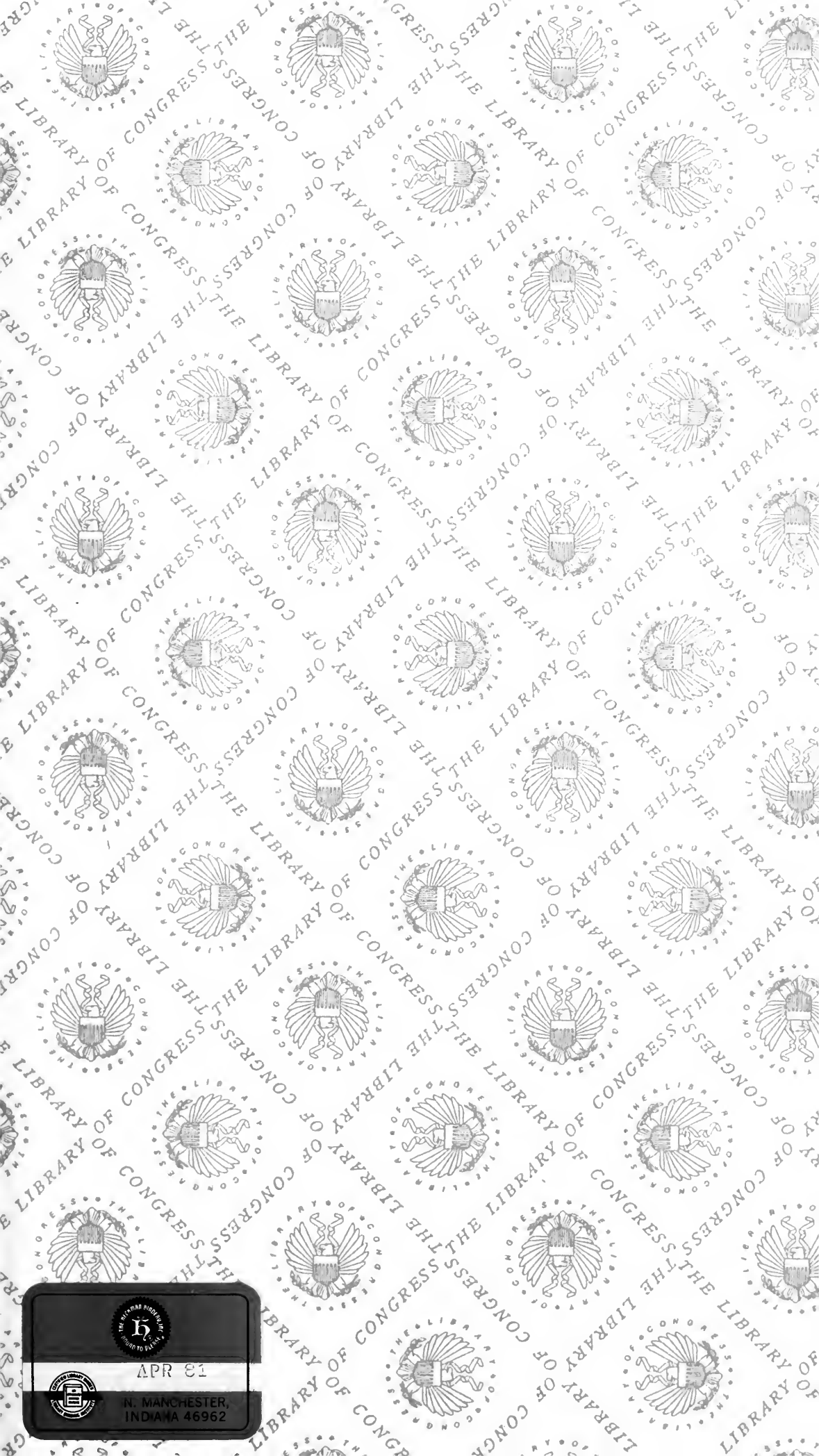


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